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WATER POLLUTION SURVEILLANCE SYSTEM. VOLUME 4. WESTERN GREAT LAKES BASIN; LAKE ERIE BASIN

Public Health Service
Washington, D. C.

30 September 1963

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WESTERN GREAT LAKES BASIN
LAKE ERIE BASIN

volume 4

PUBLIC HEALTH SERVICE

Water Pollution Surveillance System

ANNUAL COMPILATION OF DATA

October 1, 1962 • September 30, 1963

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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE • Public Health Service

WESTERN GREAT LAKES BASIN
LAKE ERIE BASIN
Volume 4

Public Health Service
Water Pollution Surveillance System

ANNUAL COMPILATION OF DATA
October 1, 1962 - - - September 30, 1963

A Federal, State and Local cooperative report on water pollution surveillance of surface waters at selected locations throughout the United States

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service, Division of Water Supply and Pollution Control
Washington, D.C. 20201

RELATED PUBLICATIONS:

National Water Quality Network
Annual Compilation of Data, October 1, 1957–September 30, 1958
Public Health Service Publication No. 663 (1958 Edition)

National Water Quality Network
Statistical Summary of Selected Data, October 1, 1957–September 30, 1958
Public Health Service Publication No. 663—Supplement 1

National Water Quality Network
Annual Compilation of Data, October 1, 1958–September 30, 1959
Public Health Service Publication No. 663 (1959 Edition)

National Water Quality Network
Annual Compilation of Data, October 1, 1959–September 30, 1960
Public Health Service Publication No. 663 (1960 Edition)

National Water Quality Network
Plankton Population Dynamics, July 1, 1959–June 30, 1961
Public Health Service Publication No. 663—Supplement 2

National Water Quality Network
Annual Compilation of Data, October 1, 1960–September 30, 1961
Public Health Service Publication No. 663 (1961 Edition)

National Water Quality Network
Annual Compilation of Data, October 1, 1961–September 30, 1962
Public Health Service Publication No. 663 (1962 Edition)

ACKNOWLEDGMENT

To increase the usefulness of the water quality data, annual compilations since 1958, including this one, have presented preliminary and unadjusted flow data for gaging stations at or near most of the Public Health Service Water Pollution Surveillance System sampling points. Final data may be obtained directly from the agency concerned. Any studies using the provisional flow data herein compiled should verify the data prior to completion of reports on such studies. For making the flow information available for this publication, grateful acknowledgment is made by the Public Health Service to:

The International Boundary and Water Commission,
United States and Mexico

The International Joint Commission, United States and Canada

The U.S. Department of the Interior
Bureau of Reclamation • Geological Survey

The U.S. Department of the Army
Corps of Engineers • Lake Survey

FOREWORD

This is the sixth annual compilation of data from the Public Health Service Water Pollution Surveillance System (formerly the National Water Quality Network). During this year, the System was increased from 122 to 128 stations. In order to provide data in a form more useful for local or regional water pollution control officials and their staffs, the present compilation is published in 11 separate volumes. The surveillance data reported herein reveal additional findings on pesticides and other organic chemicals in surface waters and on trends in radioactivity and other areas.

The Public Health Service gratefully acknowledges the assistance to our Surveillance System of the participating local, State and Federal Government agencies and private industry. The success of this program depends, in a large measure, upon their continued interest and support.

GORDON E. MCCALLUM, D. Sc.,
Assistant Surgeon General,
Chief, Division of Water Supply and Pollution Control

VOLUME 1

Northeast Basin

CONNECTICUT RIVER
at Enfield Dam, Conn.
below Northfield, Mass.
at Wilder, Vt.

HUDSON RIVER
below Poughkeepsie, N.Y.

LAKE ERIE
at Buffalo, N.Y.

MERRIMACK RIVER
above Lowell, Mass.

RARITAN RIVER
at Perth Amboy, N.J.

ST. LAWRENCE RIVER
at Massena, N.Y.

VOLUME 2

North Atlantic Basin

DELAWARE RIVER
at Philadelphia, Pa.
at Trenton, N.J.
at Martins Creek, Pa.

POTOMAC RIVER
at Washington, D.C.
at Great Falls, Md.
at Williamsport, Md.

SCHUYLKILL RIVER
at Philadelphia, Pa.

SHENANDOAH RIVER
at Berryville, Va.

SUSQUEHANNA RIVER
at Conowingo, Md.
at Sayre, Pa.

VOLUME 3

Southeast Basin

APALACHICOLA RIVER
at Chattahoochee, Fla.

CHATTAHOOCHEE RIVER
at Columbus, Ga.
at Lanett, Ala.
at Atlanta, Ga.

ESCAMBIA RIVER
at Century, Fla.

ROANOKE RIVER
at John H. Kerr Dam and
Reservoir, Va.

SAVANNAH RIVER
at Port Wentworth, Ga.
at North Augusta, S.C.

TOMBIGBEE RIVER
below Columbus, Miss.

VOLUME 4

Western Great Lakes and Lake Erie Basins

WESTERN GREAT LAKES

DETROIT RIVER
at Detroit, Mich.

LAKE MICHIGAN
at Gary, Ind.
at Milwaukee, Wis.

LAKE SUPERIOR
at Duluth, Minn.

ST. CLAIR RIVER
at Port Huron, Mich.

ST. MARYS RIVER
at Sault Ste. Marie, Mich.

LAKE ERIE BASIN

CUYAHOGA RIVER
at Cleveland, Ohio

MAUMEE RIVER
at Toledo, Ohio

VOLUME 5

Ohio and Tennessee River Basins

OHIO RIVER BASIN

ALLEGHENY RIVER
at Pittsburgh, Pa.

CUMBERLAND RIVER
at Clarksville, Tenn.

KANAWHA RIVER
at Winfield Dam, W. Va.

LITTLE MIAMI RIVER
at Cincinnati, Ohio

MONONGAHELA RIVER
at Pittsburgh, Pa.

OHIO RIVER
at Cairo, Ill.
at Evansville, Ind.
at Louisville, Ky.
at Cincinnati, Ohio
at Huntington, W. Va.
below Addison, Ohio
at Toronto, Ohio

WABASH RIVER
at New Harmony, Ind.

TENNESSEE RIVER BASIN

CLINCH RIVER
above Kingston, Tenn.
at Clinton, Tenn.

TENNESSEE RIVER
at Pickwick Landing, Tenn.
at Bridgeport, Ala.
at Chattanooga, Tenn.
at Lenoir City, Tenn.

VOLUME 6

Upper Mississippi River Basin

ILLINOIS RIVER
near Grafton, Ill.
at Peoria, Ill.

MISSISSIPPI RIVER
at Cape Girardeau, Mo.
at East St. Louis, Ill.
at Burlington, Iowa
at Dubuque, Iowa
at Lock and Dam 3 below St. Paul, Minn.

RAINY RIVER
at Baudette, Minn.
at International Falls, Minn.

RED RIVER (NORTH)
at Grand Forks, N. Dak.

VOLUME 7

Missouri River Basin

BIG HORN RIVER
at Hardin, Mont.

BIG SIOUX RIVER
below Sioux Falls, S. Dak.

KANSAS RIVER
at DeSoto, Kans.

MISSOURI RIVER
at St. Louis, Mo.
at Missouri City, Mo.
at Kansas City, Kans.
at St. Joseph, Mo.
at Omaha, Nebr.
at Yankton, S. Dak.
at Bismarck, N. Dak.
at Williston, N. Dak.

NORTH PLATTE RIVER
above Henry, Nebr.

PLATTE RIVER
above Plattsmouth, Nebr.

SOUTH PLATTE RIVER
at Julesburg, Colo.

YELLOWSTONE RIVER
near Sidney, Mont.

VOLUME 8

Southwest-Lower Mississippi River Basin

ARKANSAS RIVER
at Pendleton Ferry, Ark.
at Little Rock, Ark.
near Forth Smith, Ark.
near Ponca City, Okla.
at Coolidge, Kans.

MISSISSIPPI RIVER
at New Orleans, La.
at Delta, La.
at Vicksburg, Miss.
at West Memphis, Ark.

OUACHITA RIVER
at Bastrop, La.

RED RIVER (SOUTH)
at Alexandria, La.
at Bossier City, La.
at Index, Ark.
at Denison, Tex.

VERDIGRIS RIVER
at Nowata, Okla.

VOLUME 9

Colorado River and Western Gulf Basins

COLORADO RIVER BASIN

ANIMAS RIVER
at Cedar Hill, N. Mex.

COLORADO RIVER
at Yuma, Ariz.
above Parker Dam, Ariz.-Calif.
near Boulder City, Nev.
at Page, Ariz.
at Loma, Colo.

GREEN RIVER
at Dutch John, Utah

SAN JUAN RIVER
at Shiprock, New Mex.

WESTERN GULF BASIN

RIO GRANDE
at Brownsville, Tex.
at Laredo, Tex.
at El Paso, Tex.
below Alamosa, Colo.

SABINE RIVER
near Ruliff, Tex.

VOLUME 10

Pacific Northwest and Alaska Basins

PACIFIC NORTHWEST

CLEARWATER RIVER
at Lewiston, Idaho

COLUMBIA RIVER
at Clatskanie, Oreg.
at Bonneville, Oreg.
at McNary Dam, Oreg.
at Pasco, Wash.
at Wenatchee, Wash.
at Northport, Wash.

PEND OREILLE RIVER
at Albeni Falls Dam, Idaho

SNAKE RIVER
at Ice Harbor Dam, Wash.
at Wawawai, Wash.
at Payette, Idaho

SPOKANE RIVER
at Post Falls Dam, Idaho

WILLAMETTE RIVER
at Portland, Oreg.

YAKIMA RIVER
at Richland, Wash.

ALASKA BASIN

CHENA RIVER
at Fairbanks, Alaska

SHIP CREEK
at Anchorage, Alaska

VOLUME 11

California and the Great Basins

CALIFORNIA BASIN

KLAMATH RIVER
near Keno, Oreg.

SACRAMENTO RIVER
at Greens Landing above Courtland, Calif.

SAN JOAQUIN RIVER
near Vernalis, Calif.

GREAT BASIN

BEAR RIVER
above Preston, Idaho

TRUCKEE RIVER
at Calif.-Nev. Border
at Farad, Calif.

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ANALYTICAL AND FLOW DATA INDEX

STATION	General Description Trace Elements, Strontium 90	Radioactivity Determination	Plankton Populations	Organic Chemicals	Chemical, Physical and Bacteriological Analyses	Flow Data
	Page No.	Page No.	Page No.	Page No.	Page No.	Page No.
WESTERN GREAT LAKES						
Detroit River at Detroit, Mich	25–26	27	28–29	30	31–32	33
Lake Michigan						
at Gary, Ind	35–36	37	38–39	40	41–42	43
at Milwaukee, Wis	45–46	47	48–49	50	51–52	53
Lake Superior at Duluth, Minn	55–56	57	58–59	60	61–62	63
St. Clair River at Port Huron, Mich	65–66	67	68–69	70	71–72	73
St. Mary's River at Sault Ste. Marie, Mich	75–76	77	78–79	90	81–82	83
LAKE ERIE						
Cuyahoga River at Cleveland, Ohio	85–86	87	88–89	90	91–92	93
Maumee River at Toledo, Ohio	95–96	97	98–99	—	100–101	102

Dash (—) indicates no determination made.

THE PUBLIC HEALTH SERVICE

Water Pollution Surveillance System

The Public Health Service program for providing fundamental information on the quality of the Nation's waters stems from Public Law 660, approved July 9, 1956, as amended by Public Law 87-88, July 20, 1961. Section 4(c) thereof states: ". . . the Secretary (of Health, Education, and Welfare) shall in cooperation with other Federal, State, and local agencies having related responsibilities, collect and disseminate basic data on chemical, physical, and biological water quality insofar as such data or other information relate to water pollution and the prevention and control thereof."

To fulfill this responsibility, the Public Health Service Water Pollution Surveillance System collects, interprets, and disseminates:

a. Information on changes in water quality at key points in river systems, as such quality may be affected by changes in water use and development.

b. Continuous information on the nature and extent of pollutants affecting water quality.

c. Data which will be useful in the development of comprehensive water resources programs.

d. Data which will assist State, interstate, and other agencies in their water pollution control programs, and in the selection of sites for legitimate water uses.

Some 50 sampling stations were established when the program started, October 1, 1957. By September 30, 1963, the number had grown to 128.

Each sampling location satisfies one or more of the following criteria:

a. Major waterways used for public water supply, propagation of fish and wildlife, recreational purposes, and agricultural, industrial, and other legitimate uses.

b. Interstate, coastal, and international boundary waters.

c. Waters on which activities of the Federal Government may have an impact.

Sampling station sites are fixed only after consultation with local, State, Federal and other agencies having related interests.

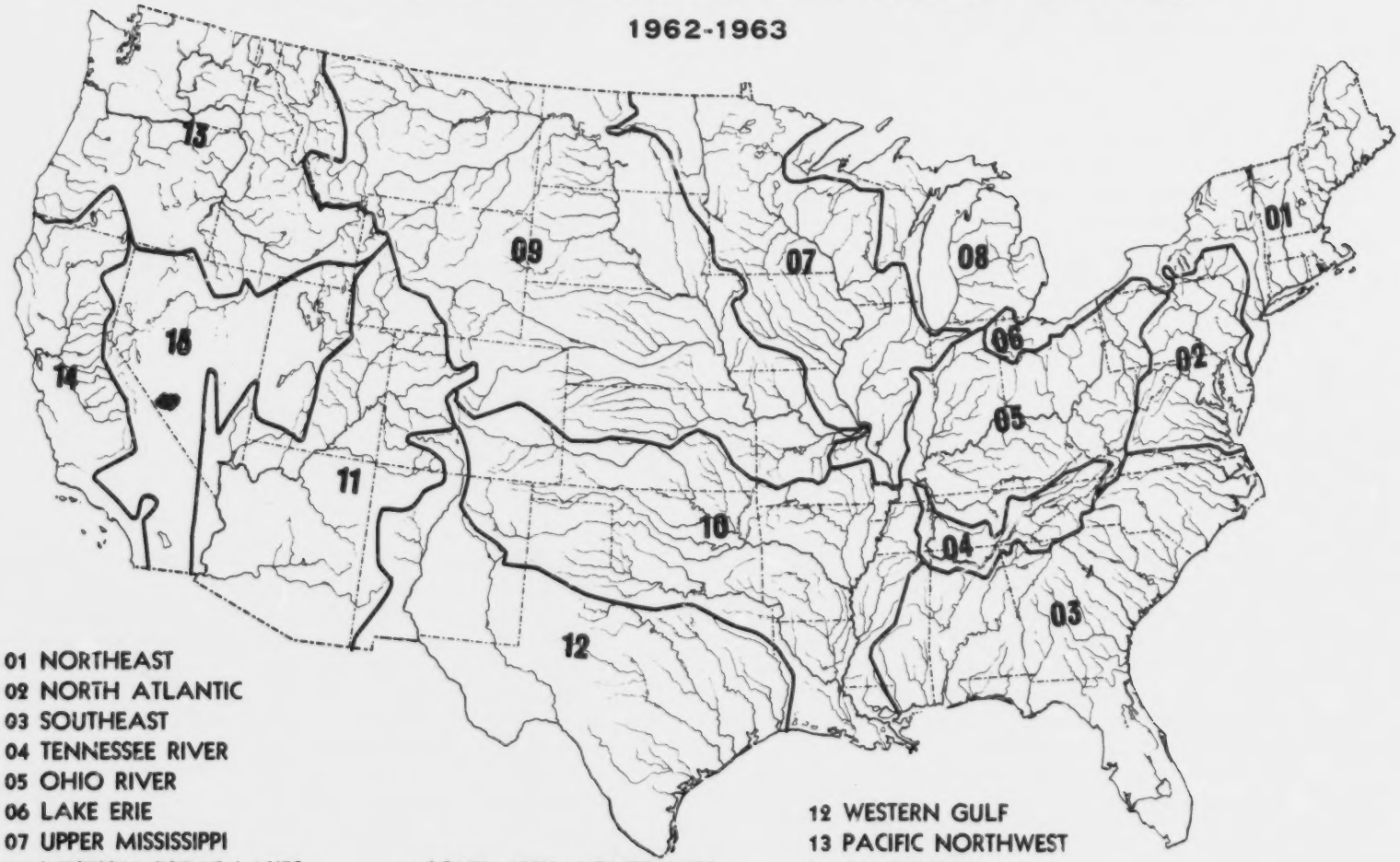
Active local participation is important in this operation. It assures maximum development of all information valuable both locally and nationally. Program costs are shared by the Federal Government and State and local agencies, those of the latter through contributions of laboratory and sampling manpower. Specifically, the State and local agencies perform certain of the conventional chemical analyses and collect samples for the newer, more complex examinations. The Public Health Service, in turn, performs the more complex determinations and makes the results available to the participants and to the public. In addition, the consultation, training facilities, and other resources of the Public Health Service are available to the cooperating agencies.

Locations of sampling stations in operation as of September 30, 1963, are shown on page 2. Descriptions of the stations, participating agencies, and other pertinent information are presented with the station data.

PHS Water Pollution Surveillance System

MAJOR RIVER BASINS OF THE UNITED STATES

1962-1963



01 NORTHEAST
02 NORTH ATLANTIC
03 SOUTHEAST
04 TENNESSEE RIVER
05 OHIO RIVER
06 LAKE ERIE
07 UPPER MISSISSIPPI
08 WESTERN GREAT LAKES
09 MISSOURI RIVER
10 SOUTHWEST—LOWER MISS.
11 COLORADO RIVER
12 WESTERN GULF
13 PACIFIC NORTHWEST
14 CALIFORNIA
15 GREAT BASIN

Only after careful screening of needs in water resource development was a pattern set for analyses of water samples.
All System samples are examined for:

a. Radioactivity.
   (1) Gross alpha.
   (2) Gross beta.
   (3) Strontium 90.
b. Plankton populations.
c. Coliform organisms.
d. Organic chemicals.
e. Biochemical, chemical, and physical measurements, including biochemical oxygen demand (BOD), dissolved oxygen (DO), chemical oxygen demand (COD), chlorine demand, ammonia nitrogen, hydrogen ion concentration (pH), color turbidity, temperature, alkalinity, hardness, chloride, sulfate, phosphates and total dissolved solids.
f. Sodium, potassium, fluoride and trace elements.

Samples for groups c and e were collected and analyzed weekly. Samples for organic chemicals were collected and analyzed monthly and plankton organism examinations were conducted semimonthly. Water samples for analysis of suspended and dissolved gross alpha and beta radioactivity were submitted weekly. Strontium 90 analyses were made on composites of weekly samples accumulated over 3-month periods. Sodium, potassium, fluoride, and trace metals were also determined on 3-month composites of weekly samples. New parameters which are developed and found significant will be included as the program continues.

Analytical Methods and Reliability of Data

The physical, chemical and biochemical data documented in this publication are the result of efforts of the cooperating agencies. In general, about half of these measurements were contributed by their laboratories. Specifically, all measurements reported for temperature, pH, DO, BOD, COD, chlorine demand and ammonia nitrogen were performed by the participants at the sample collection point. In addition, about 45 of the participating groups regularly perform all or most of the determinations for the remaining parameters included in the data. Whenever possible, analyses for stable constituents not completed by the participants are completed in the central Water Quality laboratories. While individual laboratories make minor modifications to meet local conditions, the methods used in most cases are those published in the 11th edition, "Standard Methods for the Examination of Water and Wastewater" (22). For uniformity, the chlorine demand test is reported on the basis of the starch-iodide titration procedure, and the chemical oxygen demand test is restricted to the use of 0.025 N reagents.

To assure continued reliability in the published data, frequent analysis of reference samples are made by each cooperating laboratory as an integral part of the overall program. Periodically a synthetic standard sample is provided to each participant for reference analysis. The reported results are reviewed. Any significant errors are called to the attention of the reporting laboratory and, after the cause of the errors has been determined, the previously submitted data are either corrected or discarded. From these findings, the analyses reported in this compilation are believed to be accurate to ± 10 percent of the reported values.

The analytical methods used by the Public Health Service laboratories are described in the discussion of water quality parameters which follows, and are covered by references listed in the Bibliography.

Water Pollution Parameters

In the assessment of water pollution, all of the legitimate purposes for which raw waters can be used, and which may be affected by pollution, must be considered. These may range from the minimum requirements for navigation to the ultimate in water quality demanded for certain industrial processing. Standards differ considerably, therefore, according to water use.

For domestic use, water must be free of disease organisms, clear, colorless, taste- and odor-free, and have a relatively low dissolved mineral content. Agricultural water is judged primarily on its mineral content, especially with respect to the ratio of sodium to other cations, and the presence of boron. Water for fish propogation and recreational purposes must be relatively free from domestic and industrial pollution and must be able to sustain an active flora of the smaller aquatic organisms on which fish and wildlife feed. Industrial water quality demands run the gamut from the complete absence of minerals to a requirement of low temperature, the critical factor in water used for cooling. The effects of radioactive materials on these uses have not yet been fully appraised.

The various laboratory examinations made as part of this program are discussed below.

Radioactivity

Radioactivity, long recognized as a water contaminant from natural sources, has continued to grow in importance and health significance with the development of nuclear energy for both military and peaceful uses. Consequently, levels must be measured continually as new sources are established.

Gross alpha and beta measurements are made on both suspended and dissolved solids in the raw surface water samples. The total radioactivity in the dissolved solids provides a rough measure of the levels which may be found in a treated water, where water treatment removes substantially all of the suspended matter.

Beta activity levels generally reflect the variable contamination resulting from fallout and discharges from nuclear energy installations, institutions utilizing radioactive materials, and other manmade sources. The trend of gross beta radioactivity in samples received from 47 of the Public Health Service Water Pollution Surveillance System stations operating since 1957 is presented in Figure 1. During the first three quarters of the 1962 water year, renewed weapons testing resulted in a rise in gross beta radioactivity in surface waters of the United States. During the sec-

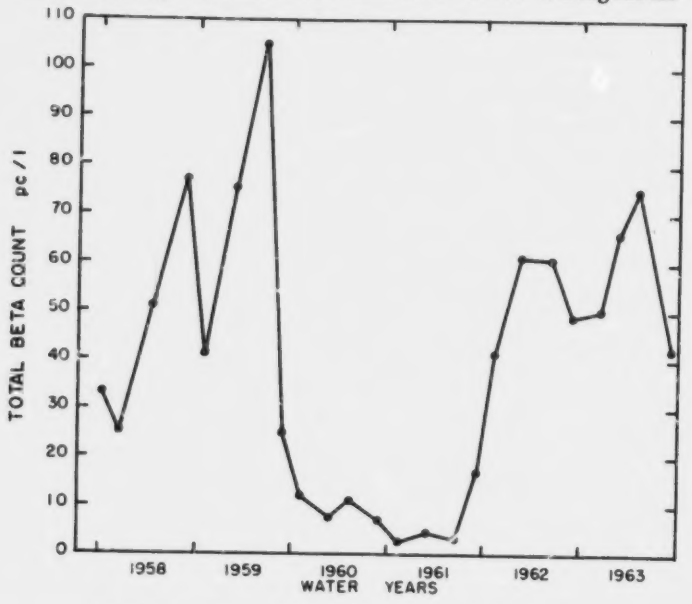


FIGURE 1. GROSS BETA RADIOACTIVITY IN THE SURFACE WATERS OF THE UNITED STATES.

ond and third quarter of water year 1963, the national average activity reached a maximum of 75 pico curies per liter and then decreased. Beta levels have remained well below the Public Health Service Drinking Water Standard of 1,000 pc/l or $\mu\mu$c/l (26).

Alpha levels reflect largely the activity added by uranium and thorium daughters. The waters of the United States can be characterized in a general way with respect to gross alpha radioactivity content. Gross alpha levels average less than 1 pc/l in east coast, Appalachian, Great Lakes, and Pacific Northwest States. On the Colorado Plateau, and along the eastern slope of the Rocky Mountains, natural radioactivity, principally from mineral deposits, results in average concentrations of about 20 pc/l.

Gross levels are most informative in ascertaining long-term trends or changes in water quality. By themselves, however, they are of limited value in assessing radiation exposure. Where gross results are consistently over the maximum permissible concentrations for mixed fission products, the identity of the specific radionuclides involved must be established.

Because of its significance in the environment, the concentration of strontium 90 in the total solids is also reported. In water year 1963, strontium 90 levels ranged from 0.4 to 11.3 pc/l. The national average reached a high of 3.8 pc/l during the fourth quarter (July, August, September 1963). Highest levels were in the north-central area of the coterminous United States where the average was approximately 6 pc/l for this quarter. All averages were less than the limit (10 pc/l) specified in the Public Health Service Drinking Water Standards (26). The levels of strontium 90 activity in waters of the United States since the first quarter of the 1959 calendar year are presented graphically in figure 2.

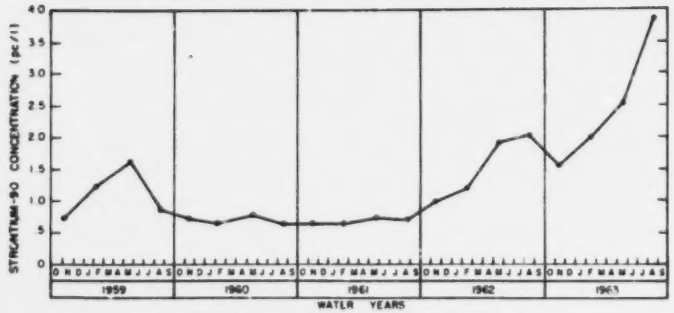


FIGURE 2. STRONTIUM-90 IN SURFACE WATER OF THE UNITED STATES

Plankton Populations

Geographical distribution of algae and other planktonic organisms are influenced by geologic and climatic factors, and result in distinctive plankton populations in different areas. Within each region, population changes are directly related to temperature, and the nature and concentration of organic and mineral substances which enter the aquatic environment. These substances may come from domestic sewage, industrial wastes, runoff from agricultural lands, irrigation discharges, or native rocks and soils. They may be basic nutrients, highly toxic, or metabolically inert. Planktonic organisms differ greatly in their sensitivity to the nutrient and toxic substances which are present. Some thrive only in water which is relatively free of nutrients while others multiply rapidly in water which has been greatly enriched. Large numbers of tolerant algae usually develop in waters containing abundant supplies of inorganic nitrogen and phosphorus resulting from the mineralization of domestic sewage. These nuisance populations may clog filters in municipal water plants, and produce objectional tastes and odors.

On the other hand, plankton populations may be eradicated by the introduction of toxic organic or mineral wastes. This is not desirable because some plankton organisms play essential roles in providing food and oxygen for higher forms of aquatic life, and in cleansing polluted waters.

Beginning at low nutrient levels, progressive enrichment of waters results in an increase in the variety and abundance of the plankton. However, as higher levels of enrichment are attained, the increase in total numbers of organisms is accompanied by a decrease in the number of kinds of organisms. This change is typical in populations which have been subjected to the wide spectrum of substances being introduced into

surface water in ever increasing amounts. Plankton counts, which provide information concerning the variety and abundance of organisms, are useful in detecting changes in the concentration of organic and mineral substances which enter water supplies.

METHODS OF ANALYSIS

Plankton samples are collected semimonthly at each station. A sample consists of 3 liters of raw water taken directly from the stream or from a treatment plant intake. Preservation is effected at the time of collection by the use of 30 ppm merthiolate.

Three types of analyses are performed:

1. Rotifers, crustacea, and other micro invertebrates are removed from a 1-liter aliquot of the sample by settling 24 hours. The sediment is placed in a special slide, 80 x 50 x 2 mm., and the organisms are enumerated under a compound microscope at 100× magnification. The counts are reported as organisms per liter.

2. A "total live algae" count is obtained from 1 milliliter of the sample by scanning two 50-mm. strips on a Sedgwick-Rafter slide using 200× magnification and a Whipple micrometer disc. An appropriate correction factor is used to convert the counts to units per milliliter. Each single cell or natural aggregate of cells (colony) occupying up to 300 square microns (μ^2) is counted as 1 unit. Large colonies are enumerated according to a modified areal-unit method in which aggregates occupying 300–1,000μ^2 are counted as 2 units, those occupying 1,000–2,500μ^2 as 3 units, those 2500–5000μ^2 as 4 units, and those over 5,000μ^2 as 5 units. About 95 percent of cell aggregates fall into size 1 or 2.

3. Identification and proportional census of diatom species are done from sediment obtained by settling 1 liter of the sample 48 hours. A small aliquot of the sediment is placed on a No. 1 coverglass and dried on a warming table. The sediment is ashed on the coverglass by heating on a hotplate, and permanent slides are made with hyrax mounting medium. Counts are made with 90× apochromatic oil immersion objectives and 10× oculars containing a Whipple micrometer disc. Random strip counts are made until the total number of units reaches 200 to 300. The same areal units are used as described for Sedgwick-Rafter counting.

Organic Chemicals

The Nation's water resources continue to receive increasing quantities of organic contaminants. Since 1940 the chemical industry, particularly in the manufacture of synthetic and petrochemicals, has experienced an enormous expansion that shows every sign of continuing. Each year millions of pounds of synthetic detergents, insecticides, herbicides, and similar domestic products find their way into our streams from household sewers, industrial waste discharges, and land runoff.

Effective and economical treatment methods for most of the complex organic materials remain to be developed. Even where treatment exists, residues may remain in sufficient quantity to cause water damage. These stable residues persist through sewage treatment, biological and chemical action of the stream, and water treatment processes, and finally reach the consumer in drinking water.

The presence of some of these materials, even at concentrations considerably less than 1 part per million, may impair water quality, most noticably in production of tastes and odors. Fishflesh tainting, also quickly noticed by the consumer, is another damage. Effects on water treatment, many of which are ill-defined at present, and impairment of water quality for industrial uses are being reported with increasing frequency. Essentially nothing is known of the possible immediate or long-term effects of these materials on human health. Such information is urgently needed.

The usual sanitary analyses are not effective in measuring these newer organic contaminants. Yet it is essential to know something of their concentrations and character. A method known as the "Carbon Adsorption Technique," developed by the Public Health Service, permits the concentration of these organic compounds from a large volume of water. Elution of the adsorbed materials with organic solvents, followed by chemical separation and testing, provides useful information concerning organic pollution and for assaying river systems for these substances.

Following continuous flow of about 5,000 gallons of water through the carbon adsorption column over a 7- to 10-day period at 0.5 gpm, material on the carbon adsorption column is extracted with two solvents, chloroform and alcohol. The residues are weighed. The concentration of these materials in the water sampled is then computed. See Explanation of Analytical Data, page 21.

CHLOROFORM EXTRACTS

The organic residue recovered from the carbon adsorption column by chloroform is very complex. It is desirable to separate the crude extract into certain broad chemical classes, and this can be done on the basis of solubility differences. The various classes or groups and their general significance are discussed briefly below.

Ether Insolubles

This group is usually a brown, humuslike powder, apparently composed to a large extent of carboxylic acids, ketones, and alcohols of complicated structure. Origin of the group, which is an indicator of "old" pollution, is believed to be partially oxidized sewage and industrial wastes. For example, the Ohio River at Cincinnati has been exposed to much industrial and sewage pollution, and hence large amounts of ether insoluble materials are found. Streams with little or no pollution history have little or no ether insolubles. Chloroform extracts contain from 0 to 30 percent of ether insoluble material.

Water Solubles

These substances are largely acidic and undistillable at moderate temperatures, but their solubility in ether indicates that the molecules are smaller and probably simpler than the ether-solubles. On the other hand, their water solubility practically requires the presence of several functional groups, such as hydroxy-acid, keto-acid, and keto-alcohol. Such compounds probably originate from partial oxidation of hydrocarbons or they may be natural substances. They have very little odor. These materials usually make up 10 to 20 percent of the total extract.

Weak Acids

This group is characterized by being removed from ether solution with sodium hydroxide but not with sodium bicarbonate. Phenols are the best known weak acids, and if present in the water, appear in this group. Other weakly acidic compounds include certain enols, imides, sulfonamides, and some sulfur compounds. This group of materials also occurs in nature. The weak acids are odorous, and commonly constitute 5 to 20 percent of the chloroform extract.

Strong Acids

These acids are usually carboxylic acids such as acetic, benzoic, salicylic or butyric. Although classified as strong in reference to carbonic acid, they are actually weak when compared with a mineral acid, such as sulfuric. Many of the compounds are used industrially, but may also be produced by natural processes, such as fermentation. Some of the materials are highly odorous. This fraction makes up from 5 to 20 percent of the total. The significance of the strong acids can be interpreted only in the light of stream pollution conditions.

Bases

These compounds are organic amines. Such materials as aniline and pyridine are amines of commerce. Lower amines may occur as a result of decomposition. Although odorous, the low concentrations found are not likely to cause objectionable conditions. However, in the case of specific amine-containing wastes the compounds can be of considerable significance. Generally, only 1 or 2 percent of the total extract is made up of the bases.

Neutrals

This group frequently constitutes the major portion of the chloroform extract. Neither basic nor acidic, the materials are less reactive and tend to persist in streams longer than many other types. Hydrocarbons, aldehydes, ketones, esters, and ethers are examples of neutral materials. The group lends itself to further fractionation by means of chromatographic separation into aliphatic, aromatic, and oxygenated subgroups:

Aliphatics: This portion represents petroleum type hydrocarbons in a considerable state of purity, and is usually made up of mineral oil type of material. The percentage of aliphatics present yields important information about the possible source of pollution, since petroleum is the most likely source.

Aromatics: These are principally the coal tar hydrocarbons such as benzene, toluene, and a host of others, and their presence in any significant amount is a reliable indication of industrial pollution. Further, the materials can frequently be identified by infrared spectrophotometry. Some aromatic compounds which have been found in our rivers—and in our drinking water—include DDT, aldrin, endrin, dieldrin, phyenyl ether, orthonitrochlorobenzene, pyridine, phenol, and others. The materials are highly odorous, and may also be toxic. Their appearance in any quantity as pollutants should receive careful evaluation.

Oxygenated compounds (Oxys): These are the neutral compounds containing oxygen, such as aldehydes, ketones, and esters. They may have originated by direct discharge or may represent oxidation products from both natural and industrial materials. They help to indicate the "age" of the pollution, since pollution exposed to oxidation forces for a long time would be expected to contain large amounts of oxys. The oxy materials are odorous.

Losses

Manipulative losses inherent in this type of separation may amount to 10 to 15 percent. Losses greater than this may indicate that volatile components were lost from the sample. Such volatiles may have significance as pollutants.

ALCOHOL EXTRACTS

The alcohol extractables generally consist of materials more polar than the chloroform extractables. They often contain synthetic detergents, carboxylic acids and humic materials which may originate naturally or from oxidized products of domestic and industrial wastes. These classes of substances are not quantitatively recovered by the alcohol extraction. For example, this extraction recovers only 20 to 30 percent of the synthetic detergents present. On waters of mixed industrial and domestic pollution, the chloroform and alcohol extractables may be about equal. On some streams where the industrial pollution is rather low and much natural pollution or sewage is present, the alcohol extractables may exceed the chloroform extractables by a factor of 4 to 6.

The alcohol extract is usually only partially soluble in water and most ordinary solvents. Very little further chemical separation of this material is currently practical. However, tests have revealed that synthetic detergents may make up 1 to 12 percent of the alcohol extract.

OTHER TESTS

Infrared spectra are routinely run on the total chloroform and alcohol extracts as well as the neutral, aliphatic, aromatic and oxygenated groups which are usually the most significant. Spectra of other groups are obtained when there is an indication that they may be significant. These spectra reveal something of the chemical structure of the materials, indicate differences and in certain instances provide a definite identification. In the case of the alcohol extracts, the infrared spectra will indicate the presence of synthetic detergents if the materials constitute a significant portion.

Thin layer chromatography has been applied successfully to the resolution of the aromatic and basic fractions of CCE. Gas chromatographic equipment with flame ionization, electron-capture and microcoulometric detectors have also been used freely in the identification of specific substances.

COMPOSITE ANALYSIS

Samples from certain locations have been selected for analysis on a quarterly composite basis. Stations that have collected at least 12 samples in a nearly consecutive manner and averaged 100 ppb. or less of chloroform extractables are selected for such analysis when certain other conditions are met. However, samples falling in this category are analyzed individually when the recovery of the chloroform extract is exceptionally high and/or it is unusual in its infrared spectrum or some other physical characteristic.

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SPECIFIC IDENTIFICATIONS

Information about specific organic substances which were identified in carbon adsorption samples is given on the second page of the group associated with each station. The increased number of pesticide and other specific compounds identified, as compared to previous years, is partly associated with greater sensitivity in analytical methodology and may be partly a reflection of the increasing usage of these substances in the total environment.

Chemical, Physical, and Bacteriological Examinations

The various biochemical, chemical, physical, and bacteriological examinations generally performed by the participating laboratories are discussed below.

AMMONIA NITROGEN AND CHLORINE DEMAND

The cost of water treatment for domestic use is affected by the consumption of chlorine, with ammonia nitrogen being responsible for a large portion of the chlorine demand. The greater this demand, the more expensive is the treatment. The ammonia may originate from unstabilized domestic pollution, from industrial waste discharges, from run-off containing fertilizers used in farming operations or from all three. The presence of measurable quantities of nitrogen compounds, not necessarily ammonia, is also an indication of the fertility of the stream toward both macro- and micro-biological forms.

COLOR

Color in domestic water supplies is undesirable. Its removal in the water treatment process, whether it be from natural or industrial sources, may require large doses of chemicals and be expensive.

DISSOLVED OXYGEN, BIOCHEMICAL AND CHEMICAL OXYGEN DEMANDS

Biochemical processes, in which aquatic organisms attack and stabilize the organic matter present, require dissolved oxygen. If unstable oxidizable organic matter is present in excess, the organisms will multiply rapidly, consuming the oxygen present in the water, and bring about a foul, septic stream condition. The dissolved oxygen level thus serves to indicate the biochemical activity of the stream. High activity, resulting in low dissolved oxygen levels, will drive out game fish in favor of scavengers. Very low or zero oxygen levels will kill all fish and aquatic organisms dependent on dissolved oxygen for life. Temperature and reaeration rates also affect dissolved oxygen levels.

The 5-day biochemical oxygen demand (BOD) indicates the degree of unstabilized organic pollution from either domestic or industrial sources, to which the stream is being subjected. A significant demand will affect the fish and macroorganism population, and waters carrying a high BOD seldom contain game fish. On the other hand, game fish will thrive in streams in which the oxygen demand has been stabilized, as this condition is usually favorable for the growth of organisms on which fish feed.

The chemical oxygen demand analysis serves to support the findings of the biochemical oxygen demand test. It too may indicate to what extent the waste load of the stream has been stabilized, or it may indicate the presence of organic and inorganic pollution which is not readily oxidized by biological processes. Because the chemical oxygen demand can be determined quickly in comparison to the biochemical oxygen demand, the establishment of a correlation between the two parameters serves to reduce the number of the latter determinations required. The chemical demand results are nearly always higher than the biochemical demand.

TEMPERATURE

Temperature is particularly important to conservation and industry. A few degrees elevation in temperature due to cooling water discharges may seriously limit the capacity of a stream to support fish life. Also, high water temperatures increase the cost of cooling water for

industrial operations. Cooling towers and other equipment for handling cooling water must be engineered to the temperature levels normally encountered.

MINERAL CONSTITUENTS

These determinations include alkalinity, hydrogen-ion concentrations (pH), hardness, chlorides, sulfates, and total dissolved solids. The pH indicates whether water is acidic or alkaline, corrosive or passive. Alkalinity is a measure of the neutralization reserve present, or the extent to which the water can resist a change from an alkaline to an acid condition upon addition of acidic chemicals. This information is important to the water treatment plant operator and to many other water users.

Hardness is not only a measure of the soap consuming property, but is also of importance in the treatment of boiler waters, where removal of hardness is one of the most important functions. Chloride, sulfate, and total dissolved solids add further information on the gross dissolved mineral content carried by the stream. These are of great importance when considering the taste or palatability of water. They are also important when the water is being demineralized for specific industrial processes, since the cost of demineralization is a direct function of the dissolved solids content of the water. In addition, waters of high saline content are less desirable and may at times even be unfit for municipal, irrigation, and other uses.

TURBIDITY

Turbidity of water is due to the suspension of clay, silt, finely divided organic matter, microscopic organisms, and other similar materials. Its presence is of particular importance in water treatment processes and in the propagation of fish and other aquatic life.

COLIFORM ORGANISMS

Information about fecal pollution is essential to water quality measurements. Data on coliform bacteria, used as indicators of pollution, help to point up the trends in the effectiveness of treatment of domestic waste discharges.

The delayed-incubation membrane filter technique is used for the coliform examination, instead of the fermentation tube (MPN) method. The latter necessitates transport of water samples to the Water Quality Section laboratory for examination, with a time lapse between collection and examination that can significantly change their microbial content. Also, some of the many other bacteria present in raw water might overgrow or otherwise inhibit the demonstration of the coliform organisms. In the delayed-incubation membrane filter procedure, the bacteria are filtered out from the fluid samples immediately after collection and the filters sent to the Water Quality Section laboratory on a preservative medium. In the laboratory the membrane filters carrying the bacteria are transferred to a medium selective for coliform organisms, then incubated and counted. The resulting counts approach very closely the actual numbers of coliform bacteria present in the water samples at the time of collection.

Unusual populations of coliform bacteria may mean increased pollution and ensuing loss of water quality. The Public Health Service Water Pollution Surveillance System studies and reports the trends in sewage pollution on streams as indicated by the trends of coliform counts.

Trace Elements and Other Determinations

This year's trace element data differ somewhat from data reported in previous compilations in that the manner of obtaining the data has been modified and the program of elements measured altered. The trace metals measurements are now obtained from a 3.4 meter direct reading spectrograph. Tin, antimony, and bismuth have been discontinued; arsenic, boron, phosphorus, aluminum, and strontium have been added. Increased sensitivity for several elements has been attained, especially zinc, manganese, and beryllium, resulting in fewer indeterminate values.

Twice during the year, 3-month composites of the weekly samples were prepared and subjected to analysis. Examinations covered those elements included in the Public Health Service Drinking Water Standards (*26*), and other metals considered to have possible physiological or

toxicological significance. The ultimate goal of this phase of the program is to provide background data on all elements which may be found in water and which may be of significance in water quality management.

In carrying out the spectrographic examination, the sample is first passed through a membrane filter, .045 micron pore size, to remove all suspended matter. An aliquot of sample is then acidified with redistilled nitric acid and evaporated to a concentration containing 100 mg. of dissolved solids in 5.0 ml. A portion of the prepared sample is placed in a porcelain boat and sparked using a rotating disc, with concentrations of the 19 programed elements measured on the direct reader (*12*).

Waters of low dissolved solids content can be concentrated to a greater degree than those having a high dissolved solids content, thus accounting for the variable sensitivity shown in the tabulations. Values followed by an asterisk (*) show the limits of sensitivity at which the test was performed and indicate that the ion being measured was not detected at that level.

It is known that trace concentrations of some ions are subject to precipitation and adsorption on container surfaces during storage. This applies particularly to iron and manganese which are subject to oxidation. Hence, all the values reported by the spectrographic method represent the quantity of metal in solution at the time of analysis to within about 10 percent.

The measurement of sodium and potassium is performed using a flame procedure. Fluoride is determined with the SPADNS reagent using the method described by Bellack and Schouboe (*3*). Boron, previously measured by the curcumin procedure, is now reported from the spectrograph. Measurement of selenium has been eliminated due to the general absence of this element from the samples examined.

The concentrations of surface active agents, reported as alkyl benzene sulfonate (ABS), in the Nation's surface waters is reported for the first time on a number of selected stations. As the capability of determining this pollutant increases, efforts will be made to include all sampling points in the Surveillance System. The data presented here were obtained using a modification of the Standard Methods methylene blue procedure on an automatic analyzer.

The Benthos

Animals and plants that live in or on the bottom substrata of lakes and streams are known as the benthos. This biological community includes such common animals as immature insects, worms, clams, snails, and crustacea. The benthic populations found on a stream bottom are largely determined by the type of substrate. Bottoms consisting of soft silty sediments are normally inhabited by animals that are able to burrow into the sediments and feed on organic detritus in the sediments. These include worms, clams, and certain insect larvae. The number of species is usually small in these habitats. Shallow streams with shoals, rapids, and riffles have more available niches for animals to occupy and the normal benthic fauna usually includes a large variety of organisms.

The benthic populations provide a basic indicator of general water quality. Whereas the plankton organisms move downstream with the current, and fish are able to migrate considerable distances, the benthos is a population relatively fixed on the bottom and the animals are subject to the water flowing over them. The benthic populations will therefore be influenced by the quality of the water.

The animals that make up the benthos have various life cycles. Insects may exist as aquatic larvae living in the bottom for as long as 2 years. They then emerge as adults and mate. The female deposits fertilized eggs into the stream. Some of the class produce young which attach themselves to fish. Some of the worms reproduce asexually. An analysis of the age structure of certain forms in the benthos may provide information on past conditions of the water.

Under conditions of good water quality the benthos should include a variety of species with no one species being present in excessive numbers. If the water should become degraded, certain species in the population, intolerant of the changed environment, will die out; and as the water quality deteriorates, increased numbers of species in the benthos will be eliminated. The one or more species that survive may be able to develop very large populations. Toxic materials in the water or deposited on the bottom may effectively eliminate all bottom life.

At each station where bottom samples are taken an attempt is made to find areas of suitable substrate. From these areas, where pos-

sible, a series of at least six quantitative samples is taken by means of suitable dredges or samplers. In riffles the Surber squarefoot sampler is used. In deep rivers the Ekman or Peterson dredge is used (see Standard Methods, for the Examination of Water and Wastewater, 11th edition, pp. 572–582) (22). A general qualitative collection of invertebrate life is usually made at all stations.

The bottom materials are screened in the field using a screen with 28 meshes to the inch. The concentrated sample is preserved in alcohol and returned to the laboratory.

In the laboratory the sample is transferred to pans and the macroscopic organisms are separated from the sediment and detritus. The animals are then identified as near to species as possible, enumerated, and weighed. Specimens are preserved and retained for future reference.

During this year benthos data were gathered for stations in the Ohio and Tennessee River basins only and are presented with the descriptive material for the appropriate stations. A supplemental analysis of these data will be published separately.

Fish Populations

Fish are a biological end product of the aquatic environment. They are an important source of food, and sport fishing is one of our leading forms of recreation. The maintenance of fish life has been recognized by the Congress, and by States which have protective pollution control legislation, as an important and legitimate use of our Nation's waterways. In other words, in measuring fish populations at Surveillance System stations, we are not measuring a parameter that affects a water use as in the case of other measurements presented in this compilation, but rather a unique parameter that is in itself considered a beneficial water use.

The water quality requirements and tolerance of aquatic life to different types of contaminants vary tremendously. It is this variability in response which makes living aquatic organisms usable indicators of environmental disturbance. Fish require water relatively high in dissolved oxygen, and are intolerant of many chemical and physical contaminants resulting from agricultural, industrial and mining practices. However, the tolerance of different species varies, and man-induced changes of the environment often affect one species more than another, producing imbalanced populations which quite often favor the species less desirable economically.

Moderate amounts of putrescible wastes may enrich the habitat, resulting in great increases in standing crops of fish present. However, under such conditions, the more tolerant and adaptable species may comprise a disproportionate share of the total population, and very sensitive species may be eliminated altogether. The effect of toxic wastes may vary from complete elimination of populations to a reduction in reproductive capacity, growth and resistance to disease and parasitism.

Fish kills are a spectacular and obvious indication that an abrupt change has taken place in the environment. However, because of high mobility resulting in rapid recruitment, the fish population in a river or stream may return to normal levels within a very short time after a kill.

Chronic pollution, to which the fish population must adjust over a period of time, will be reflected in the kinds and relative abundance of the fish species present. In addition to the species composition, the condition of the fish, their growth, reproductive success and certainly their palatability are factors of considerable importance in evaluating the suitability of a body of water for supporting usable stocks of fish.

During the current water year, data on fish populations were gathered for some stations in the Ohio and Tennessee River basins only, and are presented in tables in volume 5 for the appropriate stations.

Fish samples at these stations were collected primarily with rotenone and with an electrofishing device. Five percent emulsified rotenone was applied at suitable sites, where an area of 1 to 3 acres could be blocked off with nets during the rotenoning operation. Such sites were usually in the form of small coves along the shoreline, the mouths of small tributaries, or behind the partial enclosure created by navigational lock walls. An electrical shocking device was used along the shoreline both during the day and at night. In a few cases, samples were also collected with trammel nets and with short, 25-foot haul seines. Sampling with nets and seines was limited because of the paucity of habitat in large rivers which is suitable for using these types of gear.

With each method used sufficient sampling was done to collect as many species present as possible, and to obtain a measure of the relative abundance and size distribution of the various species. Every type of fishing gear is somewhat selective, and the data obtained may not be representative of the actual population composition present in the river at the time of sampling. However, the data obtained by a given method are quantitatively comparable and may be used to evaluate changes in the population composition resulting from natural and man-induced changes in the habitat. Comparisons should be based on samples collected with the same gear, during the same season of the year, and under similar conditions of stream flow and water temperature. These data will be particularly useful in determining the impact of changes in water quality on the fish populations of the Nation's rivers over long periods of time.

For convenience of comparison, the fish in the tables are grouped into six major categories based on food habits and methods of feeding:

I. Large, sight feeding carnivores that feed on other fish. This group includes most game species.

II. Species that feed primarily on insects. This group provides important forage for species in group I.

III. Species that feed primarily on plankton and algae. These also provide important forage for group I species.

IV. Species that feed primarily on mollusks.

V. Omnivores that feed indiscriminately on plant and animal matter from the bottom.

VI. Scavengers that take any available food. Some of the species in this group may sometimes act as predators. The group also includes many important food fish, and species that are tolerant of degraded conditions.

Because foods and feeding habits vary with size, age, and availability of food, there may be considerable overlap between groups. The species listed were grouped according to available literature regarding the main foods of adult specimens of each species.

In the field the total length of the fish was routinely measured to the nearest inch class on a one-half inch interval. Thus a fish in the 5-inch class would measure from 4.5 inches to slightly under 5.5 inches. If the end of the tail touched the dividing line between two length classes, the fish was included in the higher classification. The percent total number and weight are carried to the nearest one-tenth of 1 percent in the tables. The one-tenth of 1 percent was arbitrarily selected for purposes of tabulation, and does not imply such a high level of sampling accuracy.

The fish are listed by common names in the tables according to American Fisheries Society Special Publication No. 2 (1960), A List of the Common and Scientific Names of Fishes From the United States and Canada, Second edition (*1*).

Stream Flow

Stream flow data have a most important role in the utilization of water quality parameters such as are included in this report. For this reason, average daily flow records are reported for most of the sampling stations in the System.

All flow data included in this compilation are *provisional* data furnished by the agencies credited, and are subject to revision by such agencies prior to any final publication. With the exceptions mentioned, the flows are given as furnished to the Public Health Service.

The data were generally furnished in units of cubic feet per second. In general only the first three digits were considered significant. Because of machine limitations the data are reported here in thousand cubic feet per second. Even though three zeros may appear after the decimal, no artificial accuracy of measurement is implied. Only the first three digits should be considered significant. There are two exceptions:

(1) When the flow was over 1 million cubic feet per second, the first four digits are reported, and (2) at times when the Rio Grande flows were extremely low, the data were reported to tenths of a cubic foot per second. These figures are published showing 4 decimal places.

Flow data for sampling stations on the rivers of the Great Lakes system are reported as the monthly mean flow, as computed by the U.S. Lake Survey. In certain other rivers, flow data were computed by the Public Health Service from information supplied by the gaging agency. The methods of computations are shown as footnotes to the data for the applicable stations.

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Explanation of Analytical Data

RADIOACTIVITY DETERMINATIONS

In evaluating radioactivity data it should be noted that the reported errors represent counting errors only and the reported values are subject to other errors commonly associated with gross radioactivity analysis. (See Reference 22.)

A dash (—) in the count column signifies that no determination was made. An asterisk (*) following date of sample indicates that determinations are for composites of two or more samples taken on and before the date shown.

Strontium 90 determinations are reported in micro-microcuries per liter as measured from total solids in the sample composited for the quarter. A dash (—) indicates that no determination was made in that period.

PLANKTON POPULATION

Plankton data are reported on two pages. The first page lists the population size of various groups of algae. A coded number shows the ten most abundant genera of algae and their count level. Code numbers used are identified on page 18. Blank spaces on the data sheets signify that counts of other genera were below a level of 150 per ml. The second page of plankton data lists the four dominant diatom species and their occurrence as a percent of the total diatom population. The percent of occurrence of all other diatom species is shown in the next column. Identification codes of species are given on page 19.

The detectable numbers per ml. of fungi, sheathed bacteria and protozoa are shown in the next two columns. The rotifer and crustacea totals per liter are listed together with the genera where these occurred at a count level of five or more per liter for rotifers and three or more per liter for crustacea. Nematode and miscellaneous animal form counts per liter appear in the last two columns.

A dash (—) indicates that no analysis was made. A zero count of each group is indicated by "0". Blank spaces under abundance and dominance columns indicate that the populations were too few to be included or were absent. Coding for abundant genera of rotifer and crustacea population levels are presented on page 20.

PLANKTON POPULATION

Identification Codes of Algae Genera and Count Levels of Most Abundant Genera

KEY TO COUNT LEVEL (per ml.)

1 150 to 300
2 301 to 600
3 601 to 1,200
4 1,201 to 2,400
5 2,401 to 4,800
6 4,801 to 9,600
7 9,601 to 19,200
8 19,201 to 38,400
9 38,401 and over

Code to ALGAE GENERA (Producers)

Blue-green Algae

01 Agmenellum (Merismopedia)
02 Anacystis (Microcystis)
03 Anacystis
04 Coccochloris
05 Gomphosphaeria
06, 07, 08 Reserve
09 Other genus
10 Other genus

Filamentous blue-greens

11 Anabaena
12 Aphanizomenon
13 Arthrospira
14 Lyngbya
15 Oscillatoria
16 Phormidium
17 Raphidiopsis
18 Spirulina
19, 20, 21 Reserve
22 Other genus
23 Other genus

Coccoid green algae

24 Actinastrum
25 Ankistrodesmus
26 Chlorella-type
27 Chlorococcum
28 Closterium
29 Coelastrum
30 Crucigenia
31 Dictyosphaerium
32 Golenkinia
33 Lagerheimia
34 Micractinium
35 Oocystis
36 Palmellococcus
37 Pediastrum
38 Scenedesmus
39 Staurastrum
40 Tetradesmus
41 Tetrastrum
42, 43 Reserve
44 Other genus
45 Other genus

Filamentous green algae

46 Cladophora
47 Stichococcus
48 Stigeoclonium
49 Reserve
50 Other genus

Green flagellates

51 Chlamydomonas including Carteria
52 Euglena
53 Lepocinclis
54 Pandorina
55 Phacotus
56 Phacus
57 Trachelomonas
58 Reserve
59 Other genus

Other pigmented flagellates

60 Chromulina
61 Dinobryon
62 Gymnodinium
63 Peridinium
64 Reserve
65 Other genus

Diatoms (with chromatophores)

Centric

66 Biddulphia
67 Coscinodiscus
68 Cyclotella
69 Melosira
70 Rhizosolenia
71 Stephanodiscus
72 Other genus

Pennate

73 Achnanthes
74 Amphiprora
75 Amphora
76 Anomoeoneis
77 Asterionella
78 Caloneis
79 Cocconeis
80 Cymatopleura
81 Cymbella
82 Diatoma
83 Diploneis
84 Fragilaria
85 Gomphonema
86 Gyrosigma
87 Navicula
88 Nitzschia
89 Pleurosigma
90 Rhoicosphenia
91 Surirella
92 Synedra
93 Tabellaria
94, 95, 96 Reserve
97 Other genus
98 Other genus
99 Other genus

PLANKTON POPULATION

Identification Code for Diatom Species

No.	Species
01	Achnanthes lanceolata
02	Achnanthes minutissima
03	Achnanthes sp.
04	Amphiprora paludosa
05	Amphiprora sp.
06	Amphora ovalis
07	Amphora sp.
08	Anomoeoneis exilis
09	Asterionella formosa
10	Bacillaria paradoxa
11	Biddulphia laevis
12	Caloneis amphisbaena
13	Caloneis sp.
14	Ceratoneis arcus
15	Cocconeis pediculus
16	Cocconeis placentula
17	Cocconeis sp.
18	Coscinodiscus rothii
19	Coscinodiscus (brackish)
20	Coscinodiscus sp.
21	Cymatopleura solea
22	Cymatosira belgica
23	Cyclotella atomus
24	Cyclotella comta
25	Cyclotella kutzingiana
26	Cyclotella meneghiniana
27	Cyclotella pseudostelligera
28	Cyclotella stelligera
29	Cyclotella striata
30	Cyclotella sp.
31	Cymbella ventricosa
32	Cymbella tumida
33	Cymbella sp.
34	Denticula sp.
35	Diatoma elongatum
36	Diatoma vulgare
37	Diatoma sp.
38	Diploneis smithii
39	Diploneis sp.
40	Epithemia turgida
41	Epithemia sorex
42	Epithemia sp.
43	Eunotia sp. (first)
44	Eunotia sp. (second)
45	Fragilaria capucina
46	Fragilaria construens
47	Fragilaria crotonensis
48	Fragilaria pinnata
49	Fragilaria sp.
50	Frustulia sp.
51	Gomphonema olivaceum
52	Gomphonema sp.
53	Gyrosigma kutzingii
54	Gyrosigma sp.
55	Hantzchia amphioxys
56	Melosira ambigua
57	Melosira distans var. alpigena
58	Melosira granulata
59	Melosira binderana
60	Melosira islandica
61	Melosira italica
62	Melosira varians
63	Meridion circulare
64	Navicula cryptocephala
65	Navicula sp. (first)
66	Navicula sp. (second)
67	Nitzschia acicularis
68	Nitzschia tryblionella
69	Nitzschia denticula
70	Nitzschia (Lancelolatae group)
71	Nitzschia sp. (first)
72	Nitzschia sp. (second)
73	Opephora martyi
74	Pinnularia sp.
75	Pleurosigma delicatulum
76	Rhoicosphenia curvata
77	Rhizosolenia eriensis
78	Rhopalodia gibba
79	Rhopalodia sp.
80	Stephanodiscus astraea var. minutula
81	Stephanodiscus dubius
82	Stephanodiscus hantzschii
83	Stephanodiscus niagarae
84	Stephanodiscus sp.
85	Surirella brightwelli
86	Surirella ovata
87	Surirella striatula
88	Surirella sp.
89	Synedra acus
90	Synedra pulchella
91	Synedra nana
92	Synedra ulna
93	Synedra vaucheriae
94	Synedra sp.
95	Tabellaria fenestrata
96	Tabellaria flocculosa
97	Any entity not found above (first)
98	Any entity not found above (second)
99	Reserved for future entity
xx	Insignificant or population inadequate

PLANKTON POPULATION

Identification Codes of Microinvertebrate Genera and Count Levels of Most Abundant Genera

Genera of ROTIFERS
Key to counts per liter

1 5 to 10
2 11 to 20
3 21 to 40
4 41 to 80
5 81 to 160
6 161 to 320
7 321 to 640
8 641 to 1,680
9 1,681 and over

Genera of CRUSTACEA
Key to counts per liter

1 3 to 5
2 6 to 10
3 11 to 20
4 21 to 40
5 41 and over

Code to MICROINVERTEBRATES

Rotifers

01 Asplanchna
02 Brachionus (also Platyias)
03 Collotheca
04 Cephalodella
05 Chromogaster
06 Euchlanis
07 Filinia
08 Gastropus
09 Hexarthra (also Pedalia)
10 Kellicottia
11 Keratella
12 Lepadella
13 Monostyla (also Lecane)
14 Notholca
15 Philodina and similar contracted bdelloids
16 Ploesoma
17 Polyarthra
18 Pompholyx
19 Proales
20 Rotaria
21 Synchaeta
22 Trichocerca
23 to 45 Reserve
46 Other genus
47 Other genus
48 Other genus
49 Other genus

Cladocerans

50 Nauplii
51 Bosmina and related genera
52 Daphnia and related genera
53 Moina
54 Polyphemus
55 to 72 Reserve
73 Other genus
74 Other genus
75 Other genus

Copepods

76 Cyclops, Eucyclops, and Paracyclops
77 Diaptomus
78 to 97 Reserve
98 Other genus
99 Other genus

Blank—Insignificant or population inadequate

ORGANIC CHEMICALS

Although units of concentration may be assigned to the values reported herein (µg/l or parts per billion), it is essential that the user of these data consider additional associated information. Introspective examination of the data reported herein has indicated that comparison of concentration values obtained from samples of similar gallonage are more valid than samples of widely differing gallonage. In addition, recent experimental researches have shown that lower flow rates and lower sample volumes than those employed (5,000 gallons at 0.5 gpm) are substantially more efficient and should produce relatively higher concentration values with this method. The first in a series of changes designed to increase sampling efficiency is already underway at Water Pollution Surveillance System stations.

Concentration values reported for specific substances are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE. In light of an unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.

Zeros when reported have been entered. A dash indicates that the respective results were not reported. An asterisk in the column showing end of sample date indicates that the determinations are for composited samples taken on and before the date shown. The extent of compositing can be determined by examining the gallons filtered, which is the sum of the applicable individual samples immediately above it.

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

The data entered in each column are as reported. Concentrations of alkalinity and hardness are reported in milligrams per liter as $CaCO_3$. A dash signifies that the particular test was not performed. Zeroes when meaningful have been entered. An asterisk preceding a number should be read as "less than" the number following it.

TRACE ELEMENTS AND OTHER DETERMINATIONS

For a discussion of the sensitivity limits of the determinations performed with spectrographic methods, see page 11.

BASIN 8

WESTERN GREAT LAKES

The Western Great Lakes basin includes that portion of the United States that drains to Lakes Michigan, Huron, and Superior. Six PHS Surveillance System stations in the basin are located along lake shorelines or on waterways between the lakes.

Average temperatures in the basin vary from 6° to 14° F. in January and 60° to 64° F. in July. Annual precipitation ranges from 28 to 32 inches and evaporation is about 18 inches. Surface streams receive a large portion of their flow from ground water and runoff from natural lakes in the area. The region is covered with glacial drift consisting mostly of sands and loams.

The economy of the basin is based largely upon iron and copper mining, steel and automobile manufacturing, and recreation. Lake pollution is a local problem in many areas. The surveillance stations are located at water treatment plant intakes.

Before 1900, the polluted Chicago River flowed into Lake Michigan, causing severe public health problems. Since then, lake waters have been diverted through the 28-mile Chicago Sanitary and Ship Canal to the Illinois River. Average annual flows are limited to 1,500 cubic feet per second.

Phytoplankton counts at stations in this basin are generally less than 5,000/milliliter. The Great Lakes stations are characterized by having soft water, low concentrations of dissolved solids, low summer temperatures and algae counts of only a few hundred per milliliter. Somewhat higher plankton counts are noted at Gary and Milwaukee on Lake Michigan, where greater water hardness prevails.

The algae of the basin are dominated by diatoms. The most abundant pennate diatoms are *Tabellaria fenestrata, Asterionella formosa,* and *Fragilaria crotonensis.* The most abundant centrics are *Stephanodiscus hantzschii, Rhizosolenia eriensis,* and *Cyclotella comta.*

Rotifer populations of several hundred per liter have been observed in samples from the Lake Michigan stations, which generally have had the higher phytoplankton counts. These rotifer populations consisted largely of *Philodina, Keratella, Polyarthra,* and *Notholca.* Zooplankton counts at other stations were negligible.

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DETROIT RIVER AT DETROIT, MICHIGAN

The Detroit River flows from Lake St. Clair to Lake Erie. The sampling point is a short distance from Lake St. Clair. Samples are collected from the municipal water plant intake at Water Works Park.

The data show the quality of the Detroit River before it has received wastes from municipalities and from the complex of automotive, chemical, cement and metal working industries which exist downstream.

GPO 890-216

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736-485 O - 64 - 3

Station Location: Detroit River at Detroit, Michigan

Major Basin: Western Great Lakes

Minor Basin: St. Clair-Detroit Rivers

Station at: 42° 21' Latitude 82° 58' Longitude

Miles above mouth: 29

Activation Date: November 4, 1957

Sampled by: Detroit Board of Water Commissioners

Field Analysis by: Detroit Board of Water Commissioners

Other Cooperating Agencies: Michigan State Board of Health
Michigan State Water Resources Commission

Hydrologic Data:

Nearest pertinent gaging station: Detroit, Michigan (water stages only)

Gaging station operated by: U. S. Army Lake Survey

Drainage area at gaging station: —

Period of record: 1936 to date

Average discharge in record period: —

Maximum discharge in record period: —

Minimum discharge in record period: —

Remarks:

ALKYL BENZENE SULFONATE (ABS)

Date	mg/l

ELEMENTAL ANALYSES

		Composite Interval 10/1/62 to 12/31/62	Composite Interval 4/1/63 to 6/30/63
Analysis by wet or flame methods. Results in mg/l	F	.02	*.05
	Na	4.0	3.7
	K	1.2	1.0
Analysis by Spectrographic methods. Results in micrograms per liter	Zn	9	6
	Cd	*1	*1
	As	*9	*11
	B	10	12
	P	7	*6
	Fe	62	12
	Mo	15	*3
	Mn	.5	*1
	Al	-	*6
	Be	*.02	*.03
	Cu	9	7
	Ag	*.2	*.3
	Ni	*1	*1
	Co	*2	*1
	Pb	9	*3
	Cr	*1	*3
	V	*1	*6
	Ba	17	9
	Sr	55	45

*Actual value is less than the amount shown. Reported result indicates limit of sensitivity at which test was performed. See text for explanation.

STRONTIUM 90 ACTIVITY

Composite Interval	pc/l	±	Composite Interval	pc/l	±
October to December	1.1	.2	April to June	—	—
January to March	—	—	July to September	2.4	.4

± at 95% Confidence Limits

SPECIFIC QUALITATIVE IDENTIFICATIONS FROM CARBON ADSORPTION EXTRACTS WATER YEAR 1962-3

Interval	Compound	Concentration* ug/l

*Concentration values, where shown, are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE, and may be assigned the units of ug/l. In light of the unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.
See page 21.

RADIOACTIVITY DETERMINATIONS

STATE MICHIGAN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN ST. CLAIR-DETROIT RIVERS

STATION LOCATION DETROIT RIVER AT DETROIT, MICHIGAN 15

DATE SAMPLE TAKEN			DATE OF DETERMINATION		RADIOACTIVITY IN WATER												RADIOACTIVITY IN PLANKTON				
					ALPHA						BETA						DATE OF DETERMINATION	GROSS ACTIVITY			
					SUSPENDED		DISSOLVED		TOTAL		SUSPENDED		DISSOLVED		TOTAL			ALPHA		BETA	
MO.	DAY	YR.	MO.	DAY	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	MO. DAY	pc/g	±	pc/g	±
10	2	62	10	31	-	-	-	-	-	-	4	5	7	6	11	7					
10	9	62	11	7	0	0	0	0	0	0	4	5	9	6	13	8					
10	16	62	11	7	-	-	-	-	-	-	4	5	14	7	18	9					
10	23	62	11	9	-	-	-	-	-	-	0	5	16	6	16	8					
10	30	62	11	15	-	-	-	-	-	-	4	6	26	8	30	10					
11	27	62	12	12*	0	0	0	0	0	0	3	6	19	7	22	9					
12	26	62	1	18*	0	0	0	0	0	0	3	6	11	7	14	9					
1	28	63	2	19*	0	0	0	1	0	1	5	6	11	7	16	9					
2	25	63	3	18*	0	0	0	1	0	1	2	3	8	3	10	4					
3	25	63	4	15*	0	1	0	0	0	1	1	3	15	4	16	5					
4	29	63	5	17*	0	0	1	1	1	1	6	6	18	7	24	9					
5	27	63	6	17*	0	0	0	1	0	1	8	3	19	4	27	5					
6	24	63	7	15*	0	0	0	1	0	1	1	3	14	4	15	5					
7	22	63	9	6*	0	1	0	1	0	1	0	11	12	7	12	13					
8	26	63	9	20*	0	0	1	1	1	1	2	5	8	6	10	8					
9	30	63	10	22*	0	0	0	1	0	1	4	4	11	4	15	6					

PLANKTON POPULATION

STATE MICHIGAN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN ST. CLAIR-DETROIT RIVERS

STATION LOCATION DETROIT RIVER AT DETROIT, MICHIGAN

15

DATE OF SAMPLE			ALGAE (Number per milliliter)									INERT DIATOM SHELLS		MOST ABUNDANT ALGAE - Genera and Count Level per ml. (See text for Codes)																	
			TOTAL	BLUE-GREEN		GREEN		FLAGELLATED (Pyrrhophyta)		DIATOMS				1ST		2ND		3RD		4TH		5TH		6TH		7TH		8TH		9TH		10TH	
MONTH	DAY	YEAR		COCCOID	FILAMENTOUS	COCCOID	FILAMENTOUS	GREEN	OTHER	CENTRIC	PENNATE	CENTRIC	PENNATE	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL
10	2	62	500	0	0	40	0	0	0	250	250	80	170	68	1																		
10	16	62	300	0	0	30	0	0	0	180	90	40	10																				
11	6	62	100	0	0	30	0	0	0	20	90	210	60																				
11	20	62	1200	20	0	0	0	0	0	560	580	170	120	68	2	92	1																
12	4	62	100	0	0	0	0	0	20	20	110	20	30																				
12	18	62	100	0	0	0	0	0	0	0	140	30	30																				
1	8	63	100	0	0	0	0	0	0	20	60	0	0																				
1	21	63	400	0	20	0	0	0	80	0	320	40	210	77	1																		
2	4	63	300	0	0	20	0	0	40	40	230	80	60																				
2	18	63	00	0	0	0	0	0	10	0	10	0	0																				
3	5	63	300	0	0	0	0	0	20	20	240	20	20																				
3	18	63	500	0	0	0	0	20	150	60	250	40	80																				
4	1	63	400	0	0	0	0	90	0	0	360	40	200																				
4	15	63	500	0	20	0	0	20	0	40	370	40	90																				
5	6	63	900	0	0	40	0	20	0	180	680	0	220	92	1																		
5	20	63	500	0	20	0	0	0	0	20	460	70	180																				
6	3	63	2600	0	110	170	0	0	110	1470	780	460	210	71	4	92	2																
6	17	63	500	20	30	80	0	20	30	90	290	50	120																				
8	5	63	100	0	0	0	0	0	0	40	60	150	0																				
8	19	63	00	20	0	20	0	0	0	0	0	370	90																				
9	2	63	300	0	20	20	0	0	0	150	70	90	20																				
9	16	63	500	180	0	110	0	0	0	50	200	70	260	3	1																		

PLANKTON POPULATION

STATE MICHIGAN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN ST. CLAIR-DETROIT RIVERS

STATION LOCATION DETROIT RIVER AT
DETROIT, MICHIGAN 015

DATE OF SAMPLE			DOMINANT SPECIES OF DIATOMS AND PERCENT OF TOTAL DIATOMS (See text for Codes)									FUNGI AND SHEATHED BACTERIA Number per ml.	MICROINVERTEBRATES																	
			1ST		2ND		3RD		4TH				ROTIFERS										CRUSTACEA							
														GENERA AND COUNT LEVEL (See text for Codes)										GENERA AND COUNT LEVEL (See text for Codes)							
MONTH	DAY	YEAR	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	OTHER SPECIES PERCENT		PROTOZOA (Identifiable) Number per ml.	NUMBER PER LITER	1ST GENUS	1ST COUNT LEVEL	2ND GENUS	2ND COUNT LEVEL	3RD GENUS	3RD COUNT LEVEL	4TH GENUS	4TH COUNT LEVEL	5TH GENUS	5TH COUNT LEVEL	NUMBER PER LITER	1ST GENUS	1ST COUNT LEVEL	2ND GENUS	2ND COUNT LEVEL	3RD GENUS	3RD COUNT LEVEL	NEMATODES (Identifiable) Number per liter	OTHER AXIAL FORMS (Number per liter)
10	2	62	25	57	47	11	24	7	56	4	21	-	-	3										0							0	0
10	16	62	25	40	47	17	82	5	9	5	33	-	-	0										0							0	0
11	6	62	25	44	47	11	56	6	9	5	34	-	-	0										0							0	0
11	20	62	25	29	47	27	46	8	95	5	31	-	-	2										1							0	0
12	4	62	47	18	46	10	25	7	92	6	59	20	-	3										1							0	0
12	18	62	47	15	25	15	82	8	77	8	54	-	-	0										0							0	0
1	8	63										-	-	0										0							0	0
1	21	63	9	33	89	13	47	12	27	8	34	-	-	1										0							0	0
2	4	63	9	17	47	16	95	9	80	9	49	150	-	1										1							0	0
2	18	63	47	30	91	21	9	14	46	6	29	-	-	1										0							0	0
3	5	63	47	32	95	26	92	11	9	6	25	-	-	2										1							0	0
3	18	63	77	15	47	14	95	14	89	9	48	-	-	2										0							0	0
4	1	63	47	41	92	14	95	13	71	5	27	-	-	21	14	2								1							0	0
4	15	63	91	29	47	15	95	14	92	6	36	-	-	2										0							0	0
5	6	63	95	18	92	12	47	11	82	9	50	-	-	81	15	4	17	2	11	1	14	1		9	50	2					3	0
5	20	63	95	34	82	7	47	7	46	7	45	-	-	-										-							-	-
6	3	63	82	48	95	12	91	10	47	4	26	-	-	-										-							-	-
6	17	63	82	32	95	15	91	9	92	8	36	-	-	-										-							-	-
8	5	63										-	-	-										-							-	-
8	19	63										-	-	-										-							-	-
9	2	63										-	-	-										-							-	-
9	16	63										-	-	-										-							-	-

ORGANIC CHEMICALS

RECOVERED BY CARBON FILTER TECHNIQUE

RESULTS IN MICROGRAMS PER LITER
(Parts per billion)

STATE MICHIGAN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN ST. CLAIR-DETROIT RIVERS

STATION LOCATION DETROIT RIVER AT DETROIT, MICHIGAN

15

DATE OF SAMPLE					GALLONS FILTERED	EXTRACTABLES			CHLOROFORM EXTRACTABLES										
BEGINNING			END								NEUTRALS								
MONTH	DAY	YEAR	MONTH	DAY		TOTAL	CHLOROFORM	ALCOHOL	ETHER INSOLUBLES	WATER SOLUBLES	TOTAL	ALIPHATICS	AROMATICS	OXYGENATED COMPOUNDS	LOSS	WEAK ACIDS	STRONG ACIDS	BASES	LOSS
10	9	62	10	23	6300	87	17	70	-	-	-	-	-	-	-	-	-	-	-
11	5	62	11	20	6908	79	17	62	-	-	-	-	-	-	-	-	-	-	-
12	4	62	12	18	5677	125	23	102	-	-	-	-	-	-	-	-	-	-	-
12	4	62		*	18885	96	19	77	1	6	6	1	1	4	0	2	1	0	3
1	4	63	1	21	8300	100	22	78	1	7	6	1	1	4	0	2	1	0	5
2	5	63	2	18	5725	109	19	90	-	-	-	-	-	-	-	-	-	-	-
3	4	63	3	18	5100	155	28	127	1	7	11	1	1	9	0	4	1	1	3
4	1	63	4	15	3440	148	37	111	-	-	-	-	-	-	-	-	-	-	-
4	29	63	5	13	5100	150	29	121	1	10	8	1	1	6	0	3	2	1	4
5	27	63	6	10	4890	128	39	89	-	-	-	-	-	-	-	-	-	-	-
6	24	63	7	8	5535	110	26	84	1	7	9	1	1	7	0	3	1	1	4
7	22	63	8	5	6000	114	31	83	1	7	9	1	1	7	0	4	2	1	7
8	19	63	9	3	7537	80	20	60	-	-	-	-	-	-	-	-	-	-	-
9	16	63	9	30	7050	78	24	54	1	9	6	1	1	4	0	2	2	0	4

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE MICHIGAN
MAJOR BASIN WESTERN GREAT LAKES
MINOR BASIN ST. CLAIR-DETROIT RIVERS
STATION LOCATION DETROIT RIVER AT DETROIT, MICHIGAN

15

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (c-u-s units)	TURBIDITY (c-u-s units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
10	2	62	16.4	9.3	8.2	-	8	.3	.9	.0	7	82	97	0	20	15	.0	124	*3
10	9	62	17.8	9.0	8.2	.1	8	.3	.9	.0	6	81	97	0	25	15	.1	127	130
10	16	62	18.3	8.9	8.2	.2	12	.4	1.3	.0	6	81	97	0	20	14	.0	124	-
10	23	62	16.3	9.5	8.2	.2	10	.3	.9	.0	6	83	99	0	25	15	.0	117	300
10	30	62	11.4	11.0	8.1	.4	8	.3	.8	.0	6	83	97	0	30	15	.0	120	50
11	6	62	12.2	11.1	8.1	.3	9	.3	.8	.0	6	82	95	0	20	15	.0	117	67
11	13	62	11.5	11.1	8.3	.5	10	.2	.9	.0	6	82	96	0	35	15	.0	119	240
11	20	62	10.7	11.3	8.2	.1	7	.3	.7	.0	6	82	97	0	20	15	.0	120	30
11	27	62	8.7	12.4	8.0	.3	9	.6	1.3	.0	6	85	99	0	30	15	.1	120	230
12	4	62	10.2	11.6	8.1	.2	9	.3	.8	.0	6	80	95	0	15	15	.0	114	20
12	11	62	6.8	11.5	8.0	.1	8	.3	.6	.0	7	83	96	0	25	15	.0	114	60
12	18	62	5.0	12.7	8.1	.1	7	.2	.8	.1	7	82	98	0	5	15	.0	120	*3
12	26	62	4.4	13.7	8.0	.2	6	.2	.5	.0	8	81	98	0	15	15	.0	117	5
1	2	63	4.5	13.4	8.0	.3	8	.2	.5	.0	7	82	98	0	4	14	.0	120	*3
1	8	63	-	14.0	8.1	.3	8	.2	.6	.0	7	84	98	0	2	14	.0	114	5
1	15	63	4.1	14.1	8.0	.2	11	.3	.5	.0	6	83	97	0	1	15	.0	122	5
1	21	63	4.1	14.1	8.0	.5	8	.3	.7	.0	8	87	106	0	7	16	.0	126	*3
1	28	63	4.4	14.2	8.0	.4	8	.4	.7	.0	9	84	102	0	2	15	.0	120	5
2	4	63	3.9	14.2	8.1	.9	10	.4	.6	.0	7	84	103	0	2	15	.0	127	10
2	18	63	4.7	14.0	8.1	.0	3	.3	.6	.0	6	83	100	0	1	14	.0	116	*3
2	25	63	4.0	14.2	8.2	.4	7	.3	.6	.0	6	81	99	0	2	15	.0	115	*3
3	4	63	4.4	14.0	8.1	.2	3	.2	.5	.0	6	82	100	0	1	14	.0	124	-
3	5	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*3
3	11	63	4.1	14.4	8.2	.6	8	.2	.6	.0	7	81	98	0	2	16	.0	116	*3
3	18	63	4.7	13.9	8.1	.7	7	.3	.6	.0	7	80	97	0	2	17	.0	125	10
3	25	63	7.9	13.1	8.1	1.2	11	.4	1.3	.0	8	79	97	0	3	15	.0	124	370
4	1	63	7.4	13.0	8.2	1.6	15	.8	1.6	.0	7	81	100	0	15	16	.1	124	10
4	8	63	9.4	11.9	8.3	1.6	17	.4	1.1	.0	7	83	103	0	25	16	.0	133	*3
4	15	63	10.0	11.8	8.2	.6	10	.3	1.0	.0	7	86	102	0	6	15	.0	123	*10
4	22	63	10.7	11.4	8.3	.7	9	.3	.9	.0	7	80	97	0	8	15	.0	123	5
4	29	63	11.4	12.3	8.4	2.0	8	.4	.9	.0	8	81	98	0	10	16	.0	123	*3
5	6	63	12.4	10.9	8.0	1.0	9	.3	.6	.0	7	82	98	0	45	15	.0	120	10
5	12	63	13.4	10.1	8.2	.4	8	.3	.9	.0	7	83	100	0	50	15	.0	118	-
5	20	63	12.9	10.3	8.2	.7	9	.3	.9	.0	7	83	100	0	40	15	.1	127	-
5	27	63	14.3	11.4	8.6	1.7	10	.6	1.7	.0	10	89	111	0	30	19	.0	152	10
6	3	63	17.3	10.3	8.4	1.2	4	.5	1.3	.0	8	83	98	0	15	16	.0	136	63
6	10	63	20.1	10.3	8.6	.7	8	.4	1.3	.0	7	80	97	0	15	15	.0	122	5
6	17	63	18.5	9.5	8.5	.9	5	.4	1.3	.0	8	84	103	0	10	17	.0	132	20
6	24	63	19.3	8.9	8.3	.0	4	.3	1.2	.0	7	80	97	0	15	16	.0	116	*3

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE MICHIGAN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN ST. CLAIR-DETROIT RIVERS

STATION LOCATION DETROIT RIVER AT DETROIT, MICHIGAN 15

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (cobalt units)	TURBIDITY (silica units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
7	1	63	23.4	9.6	8.4	.6	9	.5	1.5	.0	8	82	98	0	10	16	.0	123	*3
7	8	63	22.1	9.8	8.4	1.0	8	.4	1.1	.0	7	80	96	0	20	15	.0	111	*3
7	15	63	21.7	8.0	8.4	.2	8	.3	1.2	.0	7	78	94	0	45	16	.1	110	100
7	22	63	23.4	7.4	8.4	.9	31	.4	1.7	.0	9	80	96	0	20	18	.1	117	10
8	5	63	23.0	9.1	8.5	.5	9	.3	1.3	.0	8	80	99	0	15	15	.1	128	20
8	12	63	23.5	7.8	8.4	.1	10	.4	1.1	.0	7	79	99	0	20	15	.0	133	20
8	26	63	21.3	8.3	8.3	.1	9	.4	1.2	.0	8	80	99	0	20	14	.0	131	10
9	2	63	21.6	8.3	8.3	.0	10	.4	1.2	.0	8	81	101	0	25	16	.0	132	60
9	9	63	21.1	8.9	8.4	.2	11	.5	1.1	.0	8	81	97	0	25	15	.0	121	3
9	16	63	19.0	8.9	8.3	.2	14	.7	1.5	.0	7	82	96	0	35	16	.1	126	37
9	23	63	18.2	9.1	8.4	.4	9	.3	1.0	.0	7	80	100	0	20	15	.1	118	65
9	30	63	18.4	8.8	8.3	.0	8	.4	.8	.0	7	84	98	0	25	15	.0	123	20

STREAM FLOW DATA - 1962-1963

Thousand Cubic Feet per Second

PROVISIONAL--SUBJECT TO REVISION

Supplied by U.S. Army Corps of Engineers
U.S. Lake Survey

STATE Michigan

MAJOR BASIN Western Great Lakes

MINOR BASIN St. Clair-Detroit Rivers

STATION LOCATION Detroit River at
Detroit, Michigan

Day	October	November	December	January	February	March	April	May	June	July	August	September
	184.000	179.000	173.000	148.000	140.000	169.000	175.000	176.000	176.000	176.000	177.000	175.000

LAKE MICHIGAN AT GARY, INDIANA

Samples are collected from the municipal water treatment plant intake which extends 6,000 feet into water 35 feet deep. This plant serves an estimated 200,000 people.

Lake County and Porter County, Indiana with total sewered populations of 327,670, discharge treated and untreated wastes into the Calumet River having a BOD population equivalent of 106,000. Except during periods of high runoff, most of these wastes are diverted to the Illinois River. A complex of food processing, chemical, petroleum refining, paper and metal industries discharge effluents of almost 2,000 MGD having a BOD population equivalent of 811,000 to Lake Michigan in this area.

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Station Location: Lake Michigan at Gary, Indiana

Major Basin: Western Great Lakes

Minor Basin: St. Joseph River

Station at: 41° 38' Latitude 87° 22' Longitude

Miles above mouth: ——

Activation Date: October 6, 1958

Sampled by: Gary-Hobart Water Corporation

Field Analysis by: Gary Hobart Water Corporation

Other Cooperating Agencies: Indiana State Board of Health

Hydrologic Data:

Nearest pertinent gaging station: Milwaukee, Wisconsin (lake levels only)

Gaging station operated by: U. S. Army Lake Survey

Drainage area at gaging station: ——

Period of record: 1860 to present

Average discharge in record period: ——

Maximum discharge in record period: ——

Minimum discharge in record period: ——

Remarks:

ALKYL BENZENE SULFONATE (ABS)

Date	mg/l

ELEMENTAL ANALYSES

		Composite Interval 10/1/62 to 12/31/62	Composite Interval 4/1/63 to 6/30/63
Analysis by wet or flame methods. Results in mg/l	F	.07	.15
	Na	5.0	4.8
	K	1.5	1.0
Analysis by Spectrographic methods. Results in micrograms per liter	Zn	10	10
	Cd	*1	*2
	As	*13	*16
	B	16	28
	P	23	8
	Fe	114	9
	Mo	37	17
	Mn	.7	*.8
	Al	-	8
	Be	*.03	*.04
	Cu	2	2
	Ag	*.3	*.4
	Ni	*1	*2
	Co	*3	*2
	Pb	13	*6
	Cr	*1	*4
	V	*1	*8
	Ba	21	14
	Sr	53	69

*Actual value is less than the amount shown. Reported result indicates limit of sensitivity at which test was performed. See text for explanation.

STRONTIUM 90 ACTIVITY

Composite Interval	pc/l	±	Composite Interval	pc/l	±
October to December	.7	.2	April to June	—	—
January to March	—	—	July to September	1.6	.3

± at 95% Confidence Limits

SPECIFIC QUALITATIVE IDENTIFICATIONS FROM CARBON ADSORPTION EXTRACTS WATER YEAR 1962-3

Interval	Compound	Concentration* ug/l

*Concentration values, where shown, are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE, and may be assigned the units of ug/l. In light of the unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.
See page 21.

RADIOACTIVITY DETERMINATIONS

STATE INDIANA

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN ST. JOSEPH RIVER

STATION LOCATION LAKE MICHIGAN AT GARY, INDIANA

DATE SAMPLE TAKEN			RADIOACTIVITY IN WATER												RADIOACTIVITY IN PLANKTON					
			DATE OF DETERMINATION	ALPHA					BETA						DATE OF DETERMINATION	GROSS ACTIVITY				
				SUSPENDED		DISSOLVED		TOTAL	SUSPENDED		DISSOLVED		TOTAL			ALPHA		BETA		
MO.	DAY	YR.	MO. DAY	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	MO. DAY	pc/g	±	pc/g	±
10	2	62	10 25	-	-	-	-	-	-	0	6	12	7	12	9					
10	9	62	11 5	0	0	0	1	0	1	0	9	5	5	5	10					
10	16	62	11 7	-	-	-	-	-	-	4	7	9	7	13	10					
10	23	62	12 3	-	-	-	-	-	-	10	3	13	4	23	5					
10	30	62	11 19	-	-	-	-	-	-	2	6	2	8	4	10					
11	27	62	12 12*	0	1	0	0	0	1	1	5	13	7	14	9					
12	18	62	1 18*	0	0	0	1	0	1	1	6	2	7	3	9					
1	29	63	2 21*	1	1	0	1	1	1	2	6	13	8	15	10					
2	26	63	3 18*	0	1	0	0	0	1	1	3	7	4	8	5					
3	25	63	4 15*	0	1	0	1	0	1	5	3	16	4	21	5					
4	30	63	5 20*	0	1	0	0	0	1	5	3	17	4	22	5					
5	28	63	6 17*	0	0	0	1	0	1	8	3	19	4	27	5					
6	25	63	7 15*	0	1	1	1	1	1	0	6	11	4	11	7					
7	30	63	9 9*	1	1	3	2	4	2	2	6	28	9	30	11					
8	27	63	9 20*	0	0	0	1	0	1	0	9	9	6	9	11					
9	24	63	10 22*	0	1	0	1	0	1	2	4	11	5	13	6					

PLANKTON POPULATION

STATE INDIANA
MAJOR BASIN WESTERN GREAT LAKES
MINOR BASIN ST. JOSEPH RIVER
STATION LOCATION LAKE MICHIGAN AT GARY, INDIANA

DATE OF SAMPLE			ALGAE (Number per milliliter)									INERT DIATOM SHELLS		MOST ABUNDANT ALGAE - Genera and Count Level per ml. (See text for Codes)																	
				BLUE-GREEN		GREEN		FLAGELLATED (Pigmented)		DIATOMS				1ST		2ND		3RD		4TH		5TH		6TH		7TH		8TH		9TH		10TH	
MONTH	DAY	YEAR	TOTAL	COCCOID	FILAMENTOUS	COCCOID	FILAMENTOUS	GREEN	OTHER	CENTRIC	PENNATE	CENTRIC	PENNATE	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL
10	2	62	1200	0	0	40	0	120	0	120	870	210	40	93	1	88	1	82	1														
10	16	62	1100	50	0	60	0	0	0	90	950	20	200	93	3																		
11	6	62	2500	40	0	40	0	40	190	370	1780	210	410	93	3	77	1	69	1	68	1	92	1	84	1								
11	20	62	1400	0	0	50	0	0	20	230	1060	110	160	87	2	77	1																
12	4	62	3000	0	0	100	0	0	40	1200	1700	210	0	93	3	77	2																
12	18	62	600	0	0	20	0	20	0	200	400	70	40	82	1	71	1																
1	8	63	400	0	0	30	0	0	0	90	300	20	0	93	1																		
1	22	63	1200	0	20	20	0	0	80	320	740	230	60	93	2	92	2	82	2	71	1												
2	5	63	1100	20	20	20	0	0	0	360	690	530	210	77	1	93	1	84	1	71	1												
2	19	63	900	0	0	0	0	0	0	460	440	240	130	71	2	93	1																
3	5	63	2800	0	0	0	0	0	20	2240	510	240	40	71	4	93	1																
3	19	63	1800	0	40	0	0	0	0	1240	500	440	230	71	3	84	1																
4	2	63	1200	0	0	0	0	0	0	640	590	440	220	71	3	77	1	92	1														
4	15	63	2400	0	20	40	0	0	170	650	1550	290	190	93	2	71	2	92	1	77	1	84	1										
5	7	63	1100	0	0	0	0	0	0	310	750	180	310	92	2	71	1	88	1														
5	21	63	300	0	10	30	0	0	10	30	180	30	0																				
6	4	63	600	0	90	20	0	0	0	40	460	20	290	92	1																		
6	18	63	1500	110	20	0	0	20	50	140	1200	20	160	93	2	77	1	92	1														
7	23	63	300	0	0	0	0	0	0	20	290	20	60	93	1																		
8	6	63	3400	0	0	230	0	60	20	2280	790	150	120	69	4	93	2																
8	20	63	400	0	0	40	0	0	20	110	240	110	370	84	1																		
9	4	63	1000	20	0	110	0	40	0	90	690	670	1360	84	1																		
9	24	63	1400	40	0	150	0	0	0	560	640	410	190																				

PLANKTON POPULATION

STATE INDIANA

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN ST. JOSEPH RIVER

STATION LOCATION LAKE MICHIGAN AT GARY, INDIANA

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DATE OF SAMPLE			DOMINANT SPECIES OF DIATOMS AND PERCENT OF TOTAL DIATOMS (See text for Codes)									FUNGI AND SHEATHED BACTERIA Number per ml.	MICROINVERTEBRATES																			
			1ST		2ND		3RD		4TH				PROTOZOA (Identity/table) Number per ml.	ROTIFERS												CRUSTACEA							
															GENERA AND COUNT LEVEL (See text for Codes)													GENERA AND COUNT LEVEL (See text for Codes)						
MONTH	DAY	YEAR	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	OTHER SPECIES PERCENT			NUMBER PER LITER	1ST		2ND		3RD		4TH		5TH		NUMBER PER LITER	1ST		2ND		3RD		NEMATODES (Identity/table) Number per liter	OTHER ANIMAL FORMS (Number per liter)
															GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL		GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL		
10	2	62	95	34	56	26	47	22	25	3	15	-	-	25	17	2	11	1							0							0	0
10	16	62	95	61	47	9	96	5	9	5	20	-	-	84	17	3	11	3	21	2					16	51	3					0	0
11	6	62	95	55	47	15	25	6	24	4	20	-	-	190	11	5	17	3	22	3					2							2	0
11	20	62	95	60	9	8	96	8	45	6	18	20	-	19	11	2									2							0	0
12	4	62	95	86	47	5	9	4	82	1	4	-	-	52	11	4									8	76	2					0	0
12	18	62	95	55	96	23	82	9	35	6	7	70	-	18	11	2									2							0	0
1	8	63	95	83	96	8	35	4	80	2	3	20	-	4											0							0	0
1	22	63	95	44	82	18	35	7	96	6	25	-	-	3											2							0	0
2	5	63	95	37	82	25	96	12	35	10	16	40	-	695	15	8	11	2	21	2	2	2			18	76	3	77	1			1	0
2	19	63	95	51	82	19	96	12	47	6	12	-	-	8	14	1									1							0	0
3	5	63	82	56	95	20	47	10	60	3	11	-	-	3											0							0	0
3	19	63	82	43	95	25	47	7	60	6	19	-	-	53	14	3	15	2	21	2					2							0	0
4	2	63	82	35	95	15	92	9	37	9	32	-	-	0											0							0	0
4	15	63	95	30	82	18	9	11	47	9	32	-	-	96	14	5	21	1							0							0	0
5	7	63	82	17	95	16	92	11	91	11	45	-	-	-											-							-	-
5	21	63	95	38	82	27	47	27	60	2	6	-	-	-											-							-	-
6	4	63	95	66	77	7	47	5	96	5	17	-	-	-											-							-	-
6	18	63	95	84	56	3	92	3	46	3	7	-	-	-											-							-	-
7	23	63										-	-	-											-							-	-
8	6	63										-	-	-											-							-	-
8	20	63										-	-	-											-							-	-
9	4	63										-	-	-											-							-	-
9	24	63										-	-	-											-							-	-

ORGANIC CHEMICALS

RECOVERED BY CARBON FILTER TECHNIQUE

RESULTS IN MICROGRAMS PER LITER
(Parts per billion)

STATE INDIANA

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN ST. JOSEPH RIVER

STATION LOCATION LAKE MICHIGAN AT GARY, INDIANA

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DATE OF SAMPLE BEGINNING MONTH	DAY	YEAR	END MONTH	DAY	GALLONS FILTERED	EXTRACTABLES TOTAL	CHLORO-FORM	ALCOHOL	CHLOROFORM EXTRACTABLES ETHER INSOLUBLES	WATER SOLUBLES	NEUTRALS TOTAL	ALIPHATICS	AROMATICS	OXYGEN-ATED COMPOUNDS	LOSS	WEAK ACIDS	STRONG ACIDS	BASES	LOSS
10	3	62	10	11	5000	130	37	93	-	-	-	-	-	-	-	-	-	-	-
11	6	62	11	14	5230	95	28	67	-	-	-	-	-	-	-	-	-	-	-
12	4	62	12	13	5000	123	23	100	-	-	-	-	-	-	-	-	-	-	-
12	4	62		*	15230	116	29	87	1	8	11	1	2	8	0	3	1	1	4
1	2	63	1	10	5000	109	17	92	-	-	-	-	-	-	-	-	-	-	-
1	29	63	2	14	5280	133	35	98	1	9	17	3	3	10	1	3	1	1	3
3	5	63	3	14	5210	139	41	98	-	-	-	-	-	-	-	-	-	-	-
4	2	63	4	12	4560	117	34	83	1	8	15	3	2	9	1	3	1	1	5
5	7	63	5	16	5030	123	28	95	-	-	-	-	-	-	-	-	-	-	-
6	4	63	6	12	5120	136	48	88	5	14	12	1	1	9	1	8	6	1	2
7	2	63	7	11	5000	158	71	87	-	-	-	-	-	-	-	-	-	-	-
8	6	63	8	15	5200	121	39	82	2	11	13	2	2	9	0	5	3	1	4
9	3	63	9	11	5200	126	36	90	-	-	-	-	-	-	-	-	-	-	-

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE INDIANA
MAJOR BASIN WESTERN GREAT LAKES
MINOR BASIN ST. JOSEPH RIVER
STATION LOCATION LAKE MICHIGAN AT GARY, INDIANA

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
10	2	62	17.1	8.8	8.1	1.0	20	1.2	2.3	.2	8	121	135	5	7	30	.1	158	140
10	9	62	17.3	8.4	8.1	.4	18	1.2	2.3	.3	7	120	136	5	8	25	.3	173	680
10	16	62	17.8	8.8	8.3	-	16	1.2	-	.3	8	121	136	10	15	21	.0	163	700
10	23	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	400
10	30	62	12.3	9.1	8.2	.6	22	.8	-	.0	7	125	136	5	12	29	.0	158	100
11	6	62	10.2	9.1	8.3	.8	28	1.0	2.3	.1	8	128	134	5	11	29	-	153	300
11	13	62	9.7	8.8	8.2	1.0	17	.8	2.3	.2	7	126	125	5	11	30	.1	153	36
11	20	62	8.8	10.3	8.2	3.0	24	1.0	2.9	.4	6	128	131	10	15	35	-	153	10
11	27	62	7.5	11.4	8.1	.8	16	1.3	2.9	.2	7	127	128	5	7	35	.0	156	360
12	4	62	7.9	12.0	8.2	.8	18	.6	2.3	.1	8	127	129	5	7	32	.0	154	20
12	11	62	3.3	13.0	8.3	1.2	29	.4	2.3	.3	5	127	128	20	40	35	.0	157	320
12	18	62	1.6	13.6	8.1	.5	20	.9	2.4	.3	7	125	132	15	17	35	.0	144	30
1	8	63	2.0	13.7	7.9	.6	29	1.6	3.5	.4	6	123	146	20	9	45	.0	162	600
1	15	63	1.5	14.0	8.1	-	21	.8	2.8	.1	6	126	140	10	10	33	.0	156	70
1	22	63	1.4	14.1	8.1	-	22	1.3	2.8	.1	6	132	147	10	14	26	.1	169	20
1	29	63	1.5	14.9	8.1	-	24	1.2	2.9	.2	6	134	147	10	9	26	.0	166	2
2	5	63	1.6	14.8	7.9	-	28	1.8	3.0	.4	6	135	158	15	11	34	.0	160	200
2	12	63	1.7	14.5	8.0	.4	25	2.8	3.9	.3	6	136	158	10	20	40	.0	175	*2
2	19	63	1.7	14.3	8.3	.5	25	.6	2.3	.2	6	137	152	5	9	40	.0	161	20
2	26	63	1.7	14.8	8.1	.1	24	3.2	4.9	.3	6	138	159	15	9	33	.0	168	30
3	5	63	2.2	14.9	8.1	.5	22	1.9	3.0	.1	6	136	158	10	10	35	.0	185	7000
3	12	63	2.8	14.3	8.1	.7	17	1.5	3.2	.1	7	135	154	15	14	30	.0	158	580
3	19	63	3.5	13.8	8.1	1.2	17	1.7	3.9	.2	6	130	146	15	17	30	.0	167	760
3	26	63	3.9	13.5	8.4	.2	15	.6	2.2	.1	6	117	140	5	11	22	.0	156	84
4	2	63	6.5	13.4	8.3	.2	20	.8	3.0	.1	6	118	146	5	11	24	.0	167	240
4	9	63	7.7	12.0	8.1	.7	18	1.7	4.0	.1	8	114	142	30	23	31	.0	151	5400
4	16	63	8.5	12.2	8.3	.3	17	1.3	3.9	.1	7	115	141	10	8	26	.0	165	60
4	23	63	10.3	10.8	8.1	.6	16	1.9	3.2	.1	7	116	142	10	20	25	.0	164	-
4	30	63	8.7	11.8	8.3	.8	52	1.3	3.4	.0	6	113	160	5	8	27	.0	159	4800
5	7	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	72
5	14	63	11.8	10.5	8.1	.1	55	1.3	2.2	.0	5	115	133	5	20	24	.0	168	-
5	21	63	13.3	10.0	8.1	.7	56	1.4	2.4	.0	6	115	132	0	8	26	.0	162	680
5	28	63	10.4	10.7	7.8	.7	57	1.3	2.3	.3	6	110	128	5	7	32	.0	157	1
6	4	63	10.9	11.0	8.0	-	56	1.0	2.9	.2	6	114	130	5	7	24	.0	156	10
6	11	63	12.2	9.2	7.9	.5	55	.8	3.2	.1	6	114	128	5	11	22	.0	158	660
6	18	63	17.1	8.9	8.0	.8	55	1.2	2.8	.2	7	110	130	5	9	26	.1	170	100
6	25	63	16.6	8.5	8.1	1.2	57	.8	3.2	.3	7	113	134	5	9	22	.0	168	100
7	2	63	17.5	7.6	8.0	1.5	55	1.2	3.2	.4	7	114	133	0	9	31	.0	162	200
7	9	63	21.2	7.6	8.0	-	-	-	-	.4	-	113	137	10	20	-	-	172	340

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CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE: INDIANA
MAJOR BASIN: WESTERN GREAT LAKES
MINOR BASIN: ST. JOSEPH RIVER
STATION LOCATION: LAKE MICHIGAN AT GARY, INDIANA

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
7	23	63	21.6	7.0	7.9	.5	52	1.5	3.3	.1	8	113	130	5	7	32	.0	172	380
7	30	63	15.1	7.8	7.8	.3	16	1.2	–	.1	9	112	137	5	8	32	.1	144	180
8	6	63	12.6	7.6	7.8	2.1	12	1.2	3.1	.1	7	117	146	5	7	22	.0	168	88
8	13	63	13.6	8.9	7.8	1.6	14	.6	2.5	.1	7	115	137	5	8	24	.0	186	*2
8	20	63	19.1	7.7	8.0	.9	15	1.0	–	.0	4	114	130	5	9	26	.0	162	280
8	26	63	20.5	7.4	8.0	.8	22	1.2	3.3	.0	7	114	128	5	12	33	.0	167	70
9	4	63	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	240
9	10	63	21.2	7.2	7.9	.4	18	1.0	3.3	.3	7	118	134	5	7	30	.0	168	700
9	17	63	19.4	7.8	7.9	.2	18	.6	2.5	.3	7	118	132	5	17	26	.0	148	*2
9	24	63	19.1	8.0	7.9	.9	18	.8	3.2	.3	6	116	131	5	10	26	.0	148	280

STREAM FLOW DATA - 1962-1963

Thousand Cubic Feet per Second

PROVISIONAL--SUBJECT TO REVISION

Supplied by U.S. Army Corps of Engineers
U.S. Lake Survey

STATE Indiana

MAJOR BASIN Western Great Lakes

MINOR BASIN St. Joseph River

STATION LOCATION Lake Michigan at
Gary, Indiana

Day	October	November	December	January	February	March	April	May	June	July	August	September

FLOW DATA NOT APPLICABLE --- LAKE LEVELS ONLY

LAKE MICHIGAN AT MILWAUKEE, WISCONSIN

This sampling point is in Lake Michigan at the intake of the Milwaukee water purification plant. The city discharges secondary treatment plant effluent into the lake with a BOD population equivalent of 190,000. Milwaukee has port facilities which are capable of handling ocean going vessels which enter the Great Lakes through the St. Lawrence Seaway. The principal industrial activities which may affect water quality are brewing and meat packing.

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Station Location: Lake Michigan at Milwaukee, Wisconsin

Major Basin: Western Great Lakes

Minor Basin: Lake Michigan-Western Shore

Station at: 43° 06' Latitude 87° 54' Longitude

Miles above mouth: —

Activation Date: August 15, 1960

Sampled by: Milwaukee Water Department

Field Analysis by: Milwaukee Water Department

Other Cooperating Agencies: Wisconsin State Board of Health

Hydrologic Data:

Nearest pertinent gaging station: Milwaukee, Wisconsin (lake levels only)

Gaging station operated by: U. S. Army Lake Survey

Drainage area at gaging station: —

Period of record: 1860 to present

Average discharge in record period: —

Maximum discharge in record period: —

Minimum discharge in record period: —

Remarks:

ALKYL BENZENE SULFONATE (ABS)

Date	mg/l

ELEMENTAL ANALYSES

		Composite Interval 10/1/62 to 12/31/62	Composite Interval 4/1/63 to 6/30/63
Analysis by wet or flame methods. Results in mg/l	F	.02	.15
	Na	4.0	4.6
	K	1.3	1.2
Analysis by Spectrographic methods. Results in micrograms per liter	Zn	10	*2
	Cd	*1	*2
	As	*14	*15
	B	13	13
	P	*7	*7
	Fe	34	*3
	Mo	11	*4
	Mn	.3	*.7
	Al	-	*7
	Be	*.03	*.04
	Cu	3	2
	Ag	*.3	*.4
	Ni	*1	*2
	Co	*3	*2
	Pb	7	*4
	Cr	*1	*4
	V	*1	*7
	Ba	17	10
	Sr	38	47

*Actual value is less than the amount shown. Reported result indicates limit of sensitivity at which test was performed. See text for explanation.

STRONTIUM 90 ACTIVITY

Composite Interval	pc/l	±	Composite Interval	pc/l	±
October to December	.8	.2	April to June	.8	.2
January to March	—	—	July to September	—	—

± at 95% Confidence Limits

SPECIFIC QUALITATIVE IDENTIFICATIONS FROM CARBON ADSORPTION EXTRACTS WATER YEAR 1962-3

Interval	Compound	Concentration* ug/l

*Concentration values, where shown, are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE, and may be assigned the units of ug/l. In light of the unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.
See page 21.

RADIOACTIVITY DETERMINATIONS

STATE WISCONSIN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN LAKE MICHIGAN, WESTERN SHORE

STATION LOCATION LAKE MICHIGAN AT MILWAUKEE, WISCONSIN 65

DATE SAMPLE TAKEN			RADIOACTIVITY IN WATER														RADIOACTIVITY IN PLANKTON					
			DATE OF DETERMINATION		ALPHA						BETA						DATE OF DETERMINATION		GROSS ACTIVITY			
					SUSPENDED		DISSOLVED		TOTAL		SUSPENDED		DISSOLVED		TOTAL				ALPHA		BETA	
MO.	DAY	YR.	MO.	DAY	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	MO.	DAY	pc/g	±	pc/g	±
10	1	62	10	25	-	-	-	-	-	-	3	6	4	8	7	10						
10	8	62	11	2	-	-	-	-	-	-	35	6	1	7	36	9						
10	15	62	11	9	0	0	0	1	0	1	5	5	8	7	13	9						
10	22	62	11	28	-	-	-	-	-	-	8	6	10	7	18	9						
10	29	62	11	19	-	-	-	-	-	-	4	5	12	6	16	7						
11	26	62	12	12*	0	0	0	1	0	1	1	6	14	7	15	9						
12	17	62	1	24*	-	-	-	-	-	-	1	6	9	7	10	9						
1	28	63	2	21*	0	1	0	1	0	1	15	7	12	8	27	11						
2	25	63	3	22*	0	0	1	1	1	1	0	5	9	7	9	9						
3	25	63	4	16*	0	0	0	1	0	1	3	6	11	7	14	9						
4	29	63	5	31*	0	0	1	1	1	1	2	3	10	4	12	5						
5	27	63	6	7*	0	0	1	1	1	1	2	6	18	8	20	10						
6	24	63	7	15*	0	0	0	1	0	1	1	3	8	4	9	5						
7	29	63	8	21*	0	0	1	1	1	1	0	6	9	7	9	9						
8	24	63	10	1*	0	0	1	1	1	1	1	3	6	4	7	5						
9	30	63	10	31*	0	0	1	1	1	1	3	6	15	7	18	9						

PLANKTON POPULATION

STATE WISCONSIN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN LAKE MICHIGAN, WESTERN SHORE

STATION LOCATION LAKE MICHIGAN AT MILWAUKEE, WISCONSIN

65

DATE OF SAMPLE			ALGAE (Number per milliliter)										MOST ABUNDANT ALGAE - Genera and Count Level per ml. (See last for Codes)																	
			TOTAL	BLUE-GREEN		GREEN		FLAGELLATED (Pigmented)		DIATOMS		INERT DIATOM SHELLS		1ST		2ND		3RD		4TH		5TH		6TH		7TH		8TH		9TH		10TH	
MONTH	DAY	YEAR		COCCOID	FILAMENTOUS	COCCOID	FILAMENTOUS	GREEN	OTHER	CENTRIC	PENNATE	CENTRIC	PENNATE	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL
10	1	62	1600	0	0	0	120	0	250	410	770	210	40	68	2	82	1	77	1	61	1												
10	15	62	-	-	-	-	-	0	-	-	-	-	-																				
11	5	62	300	0	0	0	0	0	10	70	190	20	60																				
11	19	62	200	0	0	0	0	0	0	60	90	80	210																				
12	3	62	300	0	0	0	0	0	0	120	180	0	0																				
12	17	62	800	80	0	0	0	0	40	410	310	80	170																				
1	7	63	500	0	0	60	0	20	0	290	150	20	40																				
1	21	63	700	0	40	0	0	20	0	270	360	80	0																				
2	4	63	200	0	0	20	0	0	0	30	120	0	20																				
2	18	63	400	0	0	0	0	0	0	290	110	0	0																				
3	4	63	100	0	0	0	0	0	0	50	60	0	60																				
3	18	63	700	0	0	0	0	0	0	610	80	60	20	71	2																		
4	1	63	2700	0	80	0	0	0	460	1870	290	290	190	71	4	65	2																
4	15	63	300	0	0	0	0	0	0	40	290	40	110																				
5	6	63	500	0	0	0	0	0	0	20	440	0	70	92	2																		
5	20	63	1800	20	80	20	0	0	20	150	1510	340	230	92	4																		
6	3	63	1700	0	20	0	0	0	20	360	1260	80	170	92	3	71	1																
6	17	63	2200	0	20	20	0	20	20	1160	1010	270	270	92	3	70	2	71	2														
7	15	63	*	-	-	-	-	-	-	-	-	-	-																				
8	5	63	800	0	0	0	0	0	0	520	310	0	20																				
8	19	63	300	0	0	0	0	0	0	170	150	40	0																				
9	3	63	200	0	0	0	0	0	0	0	130	20	70																				
9	16	63	200	0	0	0	0	0	0	110	130	70	0																				

* TOO TURBID TO COUNT

PLANKTON POPULATION

STATE WISCONSIN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN LAKE MICHIGAN, WESTERN SHORE

STATION LOCATION LAKE MICHIGAN AT MILWAUKEE, WISCONSIN 065

DATE OF SAMPLE			DOMINANT SPECIES OF DIATOMS AND PERCENT OF TOTAL DIATOMS (See text for Codes)									FUNGI AND SHEATHED BACTERIA (Number per ml.)	MICROINVERTEBRATES																					
			1ST		2ND		3RD		4TH					ROTIFERS										CRUSTACEA											
														GENERA AND COUNT LEVEL (See text for Codes)										GENERA AND COUNT LEVEL (See text for Codes)											
														1ST		2ND		3RD		4TH		5TH			1ST		2ND		3RD						
MONTH	DAY	YEAR	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	OTHER SPECIES PERCENT		PROTOZOA (Identifiable) Number per ml.	NUMBER PER LITER	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	NUMBER PER LITER	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	NEMATODES (Identifiable) Number per liter	OTHER ANIMAL FORMS (Number per liter)
10	1	62	95	48	26	16	47	8	9	6	22	0	0	173	11	4	17	4	21	3					27	51	4	76	2			0	0
10	15	62	95	46	35	11	47	8	24	7	28	-	0	102	11	5	17	1							9	51	2					0	0
11	5	62	95	23	47	17	25	14	9	10	36	0	0	66	11	3	17	2	21	2					9	51	2	76	1			3	0
11	19	62	82	20	58	10	92	10	47	8	52	0	0	2											0							0	0
12	3	62	95	23	45	19	56	11	57	10	37	0	0	1											0							0	0
12	17	62	95	33	47	19	35	8	46	6	34	60	0	0											0							0	0
1	7	63	47	24	95	23	82	23	80	6	24	0	0	0											1							0	0
1	21	63	95	23	82	21	77	9	60	9	38	0	0	0											0							0	0
2	4	63	82	30	60	15	95	11	77	8	36	-	0	0											0							0	0
2	18	63	82	46	60	18	77	6	89	5	25	0	0	0											0							0	0
3	4	63	82	47	60	14	77	7	35	6	26	0	0	0											1							0	0
3	18	63	82	45	60	13	95	8	47	5	29	-	-	0											0							0	0
4	1	63	82	36	60	14	92	7	37	6	37	-	-	0											0							0	0
4	15	63	82	27	60	17	92	13	91	7	36	-	-	0											0							0	0
5	6	63	89	23	91	15	47	15	82	15	32	-	-	-											-							-	-
5	20	63	92	26	89	16	91	16	82	14	28	-	-	-											-							-	-
6	3	63	82	31	77	17	92	11	91	10	31	-	-	-											-							-	-
6	17	63	77	22	95	21	82	19	60	11	27	-	-	-											-							-	-
7	15	63										-	-	-											-							-	-
8	5	63										-	-	-											-							-	-
8	19	63										-	-	-											-							-	-
9	3	63										-	-	-											-							-	-
9	16	63										-	-	-											-							-	-

ORGANIC CHEMICALS

RECOVERED BY CARBON FILTER TECHNIQUE

RESULTS IN MICROGRAMS PER LITER
(Parts per billion)

STATE WISCONSIN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN LAKE MICHIGAN, WESTERN SHORE

STATION LOCATION LAKE MICHIGAN AT MILWAUKEE, WISCONSIN

65

DATE OF SAMPLE BEGINNING MONTH	DAY	YEAR	END MONTH	DAY	GALLONS FILTERED	EXTRACTABLES TOTAL	CHLORO-FORM	ALCOHOL	CHLOROFORM EXTRACTABLES ETHER INSOLUBLES	WATER SOLUBLES	NEUTRALS TOTAL	ALIPHATICS	AROMATICS	OXYGEN-ATED COMPOUNDS	LOSS	WEAK ACIDS	STRONG ACIDS	BASES	LOSS
10	2	62	10	11	5410	108	21	87	0	7	6	1	0	5	0	2	1	1	4
10	25	62	12	3	*	–	–	–	–	–	–	–	–	–	–	–	–	–	–
12	21	62	12	28	5077	120	21	99	–	–	–	–	–	–	–	–	–	–	–
1	17	63	1	23	5784	74	13	61	1	5	4	1	0	3	0	1	0	0	2
2	15	63	2	25	5777	89	19	70	–	–	–	–	–	–	–	–	–	–	–
3	8	63	3	18	5052	118	30	88	1	8	12	4	2	6	0	3	1	1	4
4	1	63	4	15	5471	99	23	76	–	–	–	–	–	–	–	–	–	–	–
4	29	63	5	24	5050	143	40	103	2	14	8	0	0	7	1	3	3	1	9
6	6	63	6	24	5030	152	38	114	–	–	–	–	–	–	–	–	–	–	–
7	8	63	7	22	5000	125	41	84	3	16	6	0	1	5	0	3	3	1	9
7	31	63	8	7	2707	153	45	108	–	–	–	–	–	–	–	–	–	–	–
8	16	63	9	10	4817#	133	38	95	1	14	11	0	1	10	0	4	3	1	4
9	10	63	9	27	5465#	111	24	87	–	–	–	–	–	–	–	–	–	–	–

* INCOMPLETE FLOW DATA

\# ESTIMATED

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE WISCONSIN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN LAKE MICHIGAN, WESTERN SHORE

STATION LOCATION LAKE MICHIGAN AT MILWAUKEE, WISCONSIN

65

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (cobalt units)	TURBIDITY (silica units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
10	1	62	13.1	10.3	8.3	.8	7	1.2	1.8	.0	7	106	130	0	2	18	.0	152	210
10	8	62	14.5	10.0	8.2	.7	8	.8	1.6	.0	7	104	124	0	1	19	.0	146	40
10	15	62	14.4	10.3	8.2	1.1	9	.9	2.1	.0	7	105	125	0	1	16	.0	144	*11
10	22	62	13.6	10.9	8.4	2.0	8	.8	1.7	.0	6	106	127	0	2	19	.0	154	60
10	28	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
10	29	62	11.3	11.1	8.3	1.2	8	.5	1.1	.0	6	105	128	0	2	19	.0	154	-
11	5	62	9.8	11.0	8.0	2.4	8	.2	.9	.0	6	104	128	0	1	19	.0	140	11
11	13	62	8.6	11.6	8.2	2.2	9	.4	1.1	.0	7	105	132	0	2	18	.0	149	5
11	19	62	9.0	11.3	8.2	1.0	9	.4	1.3	.0	7	104	130	0	1	20	.0	132	2
11	26	62	6.1	12.1	8.0	1.1	10	.6	1.5	.0	7	106	130	0	1	19	.0	150	5
12	3	62	6.0	12.3	8.0	1.5	10	.8	1.7	.0	6	110	128	0	1	20	.0	154	100
12	10	62	4.3	13.1	8.0	1.6	7	.6	.7	.0	6	106	128	0	2	22	.0	149	23
12	17	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25
12	18	62	2.3	13.8	7.9	-	7	.5	.7	.0	-	106	126	0	1	19	.0	141	-
1	7	63	2.3	12.8	8.1	.4	7	.4	1.1	.0	7	106	129	0	1	20	.0	140	2
1	14	63	1.2	13.2	8.1	1.2	9	.5	.8	.0	7	108	127	0	6	19	.0	152	28
1	21	63	.3	13.5	8.0	.8	6	.4	1.0	.0	7	109	128	0	1	18	.0	152	3
1	28	63	.2	13.7	8.0	1.3	7	.6	1.2	.0	8	107	127	0	0	19	.0	150	10
2	4	63	.1	13.8	8.0	1.3	8	.9	1.4	.0	8	109	131	0	1	19	.0	157	5
2	11	63	.2	13.8	8.1	1.0	7	.3	1.4	.1	8	105	127	0	4	18	.0	157	2
2	18	63	.2	14.2	8.1	1.4	7	.8	1.8	.1	8	110	128	0	2	17	.0	157	130
2	25	63	.2	13.7	8.0	.5	9	.4	1.1	.1	7	108	128	0	1	17	.0	160	*1
3	6	63	.4	14.4	8.1	1.4	6	1.1	-	.1	7	109	131	0	1	18	.0	147	13
3	11	63	.4	13.6	8.0	1.1	10	1.1	2.5	.0	9	110	132	0	1	17	.0	160	460
3	18	63	.4	13.8	8.0	1.4	7	1.0	2.3	.1	9	109	130	0	2	19	.0	160	100
3	25	63	1.0	13.0	8.0	.9	10	1.0	1.8	.1	7	110	130	0	1	18	.0	159	100
4	1	63	1.8	13.2	7.9	1.0	6	.7	1.6	.1	7	107	128	0	2	18	.0	147	40
4	8	63	3.0	13.6	8.2	1.3	8	.5	1.8	.0	8	106	125	0	1	20	.0	145	4
4	15	63	2.9	13.7	8.1	1.3	7	.9	1.5	.1	8	107	131	0	1	19	.0	163	4
4	22	63	4.0	13.0	8.1	1.5	7	.8	2.0	.1	8	108	126	0	1	19	.0	149	95
4	29	63	4.8	13.3	8.2	2.3	8	.6	2.0	.1	7	108	128	0	1	21	.0	147	80
5	6	63	4.9	13.0	8.1	1.0	9	.8	1.3	.0	6	108	127	0	4	19	.0	153	10
5	13	63	5.9	11.9	8.0	.6	8	.9	1.6	.0	8	107	128	0	2	21	.0	149	-
5	20	63	6.0	11.8	7.9	1.1	11	.7	1.6	.0	6	108	127	0	1	20	.0	150	-
5	27	63	5.1	12.5	8.3	1.5	6	.8	1.6	.0	8	109	130	0	1	20	.0	157	180
6	3	63	5.1	12.1	8.2	1.7	12	1.0	2.0	.1	6	108	127	0	1	17	.0	145	32
6	10	63	5.1	12.3	8.2	1.5	8	1.0	2.3	.1	8	107	127	0	2	20	.0	146	5
6	17	63	7.0	12.2	8.4	1.5	11	.6	2.1	.1	6	109	128	0	1	21	.0	154	7
6	24	63	7.1	12.3	8.4	1.6	10	.9	2.4	.0	7	108	128	0	1	21	.0	149	25

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE WISCONSIN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN LAKE MICHIGAN, WESTERN SHORE

STATION LOCATION LAKE MICHIGAN AT MILWAUKEE, WISCONSIN

65

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
7	1	63	7.2	11.8	8.4	1.4	13	1.1	2.6	.1	6	107	128	0	1	19	.0	165	9
7	8	63	16.7	10.8	8.8	2.3	15	.9	2.7	.0	7	108	122	0	1	22	.0	160	30
7	15	63	7.8	11.3	8.1	1.5	11	1.0	2.5	.0	7	107	128	0	1	19	.0	146	40
7	22	63	6.9	11.0	8.2	1.0	7	1.3	2.2	.0	6	108	126	0	1	22	.0	141	5
7	28	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
7	29	63	5.8	11.2	8.1	1.4	9	.9	2.2	.0	7	110	128	0	1	22	.0	158	-
8	5	63	5.6	11.6	8.1	1.6	8	.8	2.5	.0	7	110	127	0	1	22	.0	150	5
8	12	63	8.4	10.8	8.1	1.7	9	.9	2.3	.1	6	108	127	0	2	20	.0	165	10
8	19	63	14.8	10.0	8.5	.9	8	.7	1.9	.1	6	108	125	0	2	18	.0	159	10
8	26	63	17.4	9.6	8.4	1.2	10	.7	1.9	.1	7	107	126	0	1	21	.0	150	3
9	3	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6
9	9	63	16.6	8.7	8.3	.6	8	.6	1.9	.1	7	107	124	0	1	22	.0	154	300
9	16	63	17.4	8.9	8.4	.9	8	1.1	2.1	.0	9	108	128	0	8	17	.0	158	250
9	23	63	16.9	9.4	8.4	1.0	10	.8	2.0	.0	6	108	127	0	4	20	.0	137	140
9	30	63	16.2	9.1	8.3	.9	9	.7	1.5	.0	7	108	124	0	1	21	.0	154	270

STREAM FLOW DATA - 1962-1963

Thousand Cubic Feet per Second

PROVISIONAL--SUBJECT TO REVISION

Supplied by U.S. Army Corps of Engineers
U.S. Lake Survey

STATE Wisconsin

MAJOR BASIN Western Great Lakes

MINOR BASIN Lake Michigan-Western Shore

STATION LOCATION Lake Michigan at Milwaukee, Wisconsin

Day	October	November	December	January	February	March	April	May	June	July	August	September
			FLOW	DATA	NOT	APPLICABLE	---	LAKE	LEVELS	ONLY		

LAKE SUPERIOR AT DULUTH, MINNESOTA

The municipal water plant from which samples are taken serves an estimated population of about 110,000. Samples are taken from the municipal water intake which extends 1500 feet from shore. The city of Duluth discharges chlorinated primary effluent to the St. Louis River which subsequently empties into Lake Superior.

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Station Location: Lake Superior at Duluth, Minnesota

Major Basin: Western Great Lakes

Minor Basin: Lake Superior

Station at: 46° 52' Latitude 91° 58' Longitude

Miles above mouth: —

Activation Date: October 14, 1957

Sampled by: Duluth Water, Gas and Sewage Treatment Department

Field Analysis by: Duluth Water, Gas and Sewage Treatment Department

Other Cooperating Agencies: Minnesota State Department of Health

Hydrologic Data:

Nearest pertinent gaging station: Marquette, Michigan

Gaging station operated by: U. S. Army Lake Survey

Drainage area at gaging station: —

Period of record: 1900 to present

Average discharge in record period: —

Maximum discharge in record period: —

Minimum discharge in record period: —

Remarks:

ALKYL BENZENE SULFONATE (ABS)

Date	mg/l
3-4-63	0.03
3-11-63	0.02
3-18-63	<0.02
3-25-63	0.02
4-1-63	0.02
4-8-63	0.03
4-15-63	0.02
4-22-63	0.02

ELEMENTAL ANALYSES

		Composite Interval 10/1/62 to 12/31/62	Composite Interval 4/1/63 to 6/30/63
Analysis by wet or flame methods. Results in mg/l	F	.05	.10
	Na	2.0	2.5
	K	0.9	0.5
Analysis by Spectrographic methods. Results in micrograms per liter	Zn	*1	5
	Cd	*1	*1
	As	*5	*8
	B	8	11
	P	22	6
	Fe	66	6
	Mo	*1	5
	Mn	*.3	*.4
	Al	- -	5
	Be	*.01	*.02
	Cu	4	3
	Ag	*.1	.2
	Ni	*1	*1
	Co	*1	*1
	Pb	*1	*3
	Cr	*1	*2
	V	*1	*4
	Ba	13	8
	Sr	21	27

*Actual value is less than the amount shown. Reported result indicates limit of sensitivity at which test was performed. See text for explanation.

STRONTIUM 90 ACTIVITY

Composite Interval	pc/l	±	Composite Interval	pc/l	±
October to December	.7	.2	April to June	.4	.2
January to March	—	—	July to September	—	—

± at 95% Confidence Limits

SPECIFIC QUALITATIVE IDENTIFICATIONS FROM CARBON ADSORPTION EXTRACTS WATER YEAR 1962-3

Interval	Compound	Concentration* ug/l

*Concentration values, where shown, are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE, and may be assigned the units of ug/l. In light of the unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.
See page 21.

RADIOACTIVITY DETERMINATIONS

STATE MINNESOTA

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN LAKE SUPERIOR

STATION LOCATION LAKE SUPERIOR AT DULUTH, MINNESOTA 16

DATE SAMPLE TAKEN			RADIOACTIVITY IN WATER												RADIOACTIVITY IN PLANKTON					
			DATE OF DETERMINATION		ALPHA						BETA							GROSS ACTIVITY				
					SUSPENDED		DISSOLVED		TOTAL		SUSPENDED		DISSOLVED		TOTAL			ALPHA		BETA	
MO.	DAY	YR.	MO.	DAY	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±		MO. DAY	pc/g	±	pc/g	±
10	1	62	10	25	-	-	-	-	-	-	0	7	28	6	28	9						
10	8	62	11	1	0	0	0	0	0	0	3	5	8	7	11	9						
10	15	62	12	22	-	-	-	-	-	-	1	5	6	5	7	7						
10	22	62	11	21	-	-	-	-	-	-	2	6	6	7	8	9						
10	29	62	11	17	-	-	-	-	-	-	0	5	20	6	20	7						
11	26	62	12	14*	0	0	0	0	0	0	5	5	5	5	10	7						
12	17	62	1	16*	0	0	0	0	0	0	0	8	4	6	4	10						
1	28	63	2	19*	0	0	0	0	0	0	15	7	5	6	20	9						
2	25	63	3	11*	0	0	0	1	0	1	0	6	3	5	3	8						
3	25	63	4	15*	0	1	0	1	0	1	1	3	10	3	11	4						
4	29	63	5	20*	0	0	0	0	0	0	0	3	6	3	6	4						
5	27	63	6	13*	0	1	0	1	0	1	7	11	17	11	24	16						
6	24	63	7	15*	0	0	0	1	0	1	0	6	8	3	8	7						
7	29	63	8	16*	0	0	0	1	0	1	0	5	9	6	9	8						
8	26	63	9	23*	0	1	0	1	0	1	2	3	12	3	14	4						
9	30	63	10	22*	0	1	0	1	0	1	3	4	8	4	11	6						

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PLANKTON POPULATION

STATE MINNESOTA
MAJOR BASIN WESTERN GREAT LAKES
MINOR BASIN LAKE SUPERIOR
STATION LOCATION LAKE SUPERIOR AT DULUTH, MINNESOTA

15

DATE OF SAMPLE			ALGAE (Number per milliliter)								INERT DIATOM SHELLS		MOST ABUNDANT ALGAE - Genera and Count Level per ml. (See text for Codes)																	
			TOTAL	BLUE-GREEN		GREEN		FLAGELLATED (Pigmented)		DIATOMS				1ST		2ND		3RD		4TH		5TH		6TH		7TH		8TH		9TH		10TH	
MONTH	DAY	YEAR		COCCOID	FILAMENTOUS	COCCOID	FILAMENTOUS	GREEN	OTHER	CENTRIC	PENNATE	CENTRIC	PENNATE	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL
10	1	62	400	0	0	0	0	120	0	170	120	0	40																		
10	15	62	00	0	0	0	0	0	10	30	0	0	10																		
11	5	62	00	0	0	0	0	0	0	20	20	120	120																		
11	19	62	100	0	0	0	0	0	0	0	80	0	0																		
12	3	62	100	0	0	20	0	0	0	30	50	0	20																		
12	17	62	100	0	0	10	0	0	0	30	60	10	0																		
1	2	63	00	0	0	0	0	0	0	20	20	0	0																		
1	21	63	00	0	0	0	0	0	20	0	30	30	40																		
2	4	63	100	0	20	0	0	0	20	40	40	80	150																		
2	18	63	00	0	0	0	0	0	0	0	10	0	0																		
3	4	63	00	0	0	20	0	0	0	0	0	20	0																		
3	18	63	00	0	0	0	0	0	0	0	0	0	0																		
4	1	63	00	0	0	0	0	0	0	0	20	0	20																		
4	15	63	00	0	0	0	0	0	0	0	30	0	0																		
5	6	63	00	0	0	0	0	0	0	0	0	0	30																		
5	21	63	200	0	0	0	0	20	0	80	140	30	60																		
6	3	63	200	0	0	70	0	0	0	0	80	10	10																		
6	17	63	500	0	0	130	0	0	0	300	40	0	0	68	1																
8	5	63	400	0	50	70	0	0	0	0	320	50	30																		
8	19	63	300	40	0	0	0	0	40	150	90	40	0																		
9	3	63	100	0	0	20	0	0	0	40	20	20	90																		
9	16	63	100	0	0	0	0	0	0	40	80	0	20																		

PLANKTON POPULATION

STATE MINNESOTA
MAJOR BASIN WESTERN GREAT LAKES
MINOR BASIN LAKE SUPERIOR
STATION LOCATION LAKE SUPERIOR AT DULUTH, MINNESOTA 016

DATE OF SAMPLE			DOMINANT SPECIES OF DIATOMS AND PERCENT OF TOTAL DIATOMS (See text for Codes)									FUNGI AND SHEATHED BACTERIA (Number per ml.)	MICROINVERTEBRATES																					
			1ST		2ND		3RD		4TH				PROTOZOA (Identifiable) (Number per ml.)	ROTIFERS												CRUSTACEA								NEMATODES (Identifiable) (Number per liter)	OTHER ANIMAL FORMS (Number per liter)
														NUMBER PER LITER	GENERA AND COUNT LEVEL (See text for Codes)										NUMBER PER LITER	GENERA AND COUNT LEVEL (See text for Codes)									
															1ST		2ND		3RD		4TH		5TH			1ST		2ND		3RD					
MONTH	DAY	YEAR	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	OTHER SPECIES PERCENT				GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL		GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL			
10	1	62	95	37	47	35	9	8	25	7	13	-	-	41	11	3	17	1	5	1					40	77	4	76	2	50	1	0	0
10	15	62	9	20	25	17	24	14	95	13	36	-	-	84	11	3	10	2	5	2	17	1	22	1	69	77	5	51	3	76	3	0	0
11	5	62	95	18	9	10	92	8	56	8	56	-	-	1											0							0	0
11	19	62	95	19	82	16	25	10	84	8	47	-	-	0											2							0	0
12	3	62	82	21	95	19	80	16	28	9	35	-	-	0											3							0	0
12	17	62	82	51	95	12	92	5	84	5	27	-	-	0											1							0	0
1	2	63										30	-	0											1							0	0
1	21	63										30	-	0											0							0	0
2	4	63	28	20	80	13	82	9	71	7	51	60	-	0											0							0	0
2	18	63	27	13	30	12	77	10	82	10	55	-	-	0											0							0	0
3	4	63	77	18	82	16	9	15	60	7	44	-	-	0											0							0	0
3	18	63	77	39	82	13	9	7	60	7	34	-	-	0											0							0	0
4	1	63	77	18	25	17	60	11	91	9	45	-	-	0											0							0	0
4	15	63										-	-	0											0							0	0
5	6	63										-	-	-											-							-	-
5	21	63	77	28	60	14	91	13	82	10	35	-	-	-											-							-	-
6	3	63	77	22	91	19	9	13	82	12	34	-	-	-											-							-	-
6	17	63	91	13	60	10	82	9	95	9	59	80	-	-											-							-	-
8	5	63										-	-	-											-							-	-
8	19	63										-	-	-											-							-	-
9	3	63										-	-	-											-							-	-
9	16	63										-	-	-											-							-	-

ORGANIC CHEMICALS

RECOVERED BY CARBON FILTER TECHNIQUE

RESULTS IN MICROGRAMS PER LITER
(Parts per billion)

STATE: MINNESOTA
MAJOR BASIN: WESTERN GREAT LAKES
MINOR BASIN: LAKE SUPERIOR
STATION LOCATION: LAKE SUPERIOR AT DULUTH, MINNESOTA

DATE OF SAMPLE BEGINNING MONTH	DAY	YEAR	END MONTH	DAY	GALLONS FILTERED	EXTRACTABLES TOTAL	CHLORO-FORM	ALCOHOL	CHLOROFORM EXTRACTABLES ETHER INSOLUBLES	WATER SOLUBLES	NEUTRALS TOTAL	ALIPHATICS	AROMATICS	OXYGEN-ATED COMPOUNDS	LOSS	WEAK ACIDS	STRONG ACIDS	BASES	LOSS
10	1	62	10	15	5317	105	29	76	-	-	-	-	-	-	-	-	-	-	-
11	5	62	11	19	6457	86	18	68	-	-	-	-	-	-	-	-	-	-	-
12	3	62	12	17	7477	96	15	81	-	-	-	-	-	-	-	-	-	-	-
12	3	62		*	19251	95	20	75	1	6	5	1	0	4	0	2	1	0	5
1	7	63	1	21	6982	92	14	78	-	-	-	-	-	-	-	-	-	-	-
2	4	63	2	18	6052	96	18	78	1	7	3	0	0	3	0	2	1	0	4
3	4	63	3	18	6112	92	15	77	-	-	-	-	-	-	-	-	-	-	-
4	1	63	4	15	6180	85	15	70	0	6	5	1	1	3	0	1	1	0	2
5	6	63	5	21	6330	79	29	50	-	-	-	-	-	-	-	-	-	-	-
6	3	63	6	17	5100	103	33	70	5	10	5	1	1	3	0	2	3	0	8
7	1	63	7	15	7260	88	28	60	-	-	-	-	-	-	-	-	-	-	-
8	5	63	8	19	7410	59	26	33	2	10	5	0	1	4	0	2	2	0	5
9	2	63	9	16	5932	82	32	50	-	-	-	-	-	-	-	-	-	-	-

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE MINNESOTA
MAJOR BASIN WESTERN GREAT LAKES
MINOR BASIN LAKE SUPERIOR
STATION LOCATION LAKE SUPERIOR AT DULUTH, MINNESOTA

16

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
10	1	62	12.2	10.6	7.5	.6	8	.7	1.4	.0	2	42	43	0	0	3	.0	54	17
10	8	62	12.8	10.3	7.6	.7	8	.8	1.6	.0	2	43	44	0	0	3	.0	54	1
10	15	62	12.2	10.4	7.5	1.0	8	.6	1.4	.0	2	43	44	5	0	3	.0	54	160
10	22	62	11.7	10.6	7.7	.4	9	.8	1.8	.0	2	43	44	0	2	3	.0	53	60
10	29	62	7.8	11.4	7.6	.5	8	.8	1.4	.0	2	42	43	0	2	3	.0	58	27
11	5	62	7.2	11.6	7.6	.5	9	.8	1.5	.0	2	43	44	5	3	2	.0	64	21
11	12	62	6.0	11.5	7.6	.8	9	.5	1.2	.0	2	43	44	0	0	3	.0	53	16
11	18	62	5.7	12.0	7.5	.4	8	.6	1.1	.0	2	42	43	0	0	3	.0	53	-
11	19	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
11	26	62	5.7	12.1	7.6	.3	9	.6	1.2	.0	2	42	43	0	0	3	.0	57	8
12	3	62	4.4	12.4	7.6	.5	7	.5	1.3	.0	2	43	42	0	0	3	.0	54	10
12	10	62	4.4	12.5	7.6	.5	8	.6	1.1	.0	2	42	44	0	0	2	.0	53	7
12	17	62	4.4	12.5	7.6	.4	8	.6	1.2	.0	2	43	44	0	0	2	.0	51	8
1	2	63	4.4	13.0	7.6	.2	9	.6	1.1	.0	2	42	44	0	0	3	.0	53	3
1	7	63	3.9	13.0	7.6	.2	7	.6	1.2	.0	2	42	44	0	0	3	.0	57	1
1	14	63	2.8	13.2	7.6	.2	7	.6	1.1	.0	2	43	44	0	1	3	.0	55	*1
1	21	63	2.8	13.0	7.5	.3	7	.6	1.2	.0	2	43	44	0	1	3	.0	57	10
1	28	63	3.3	13.5	7.5	.7	8	.7	1.3	.0	2	42	44	0	1	3	.0	60	7
2	4	63	3.3	13.2	7.5	.3	7	.7	1.2	.0	2	43	44	0	1	3	.0	58	2
2	11	63	1.7	13.9	7.5	.4	9	.7	1.3	.0	2	42	43	0	0	3	.0	58	1
2	18	63	1.7	14.0	7.5	.4	8	.7	1.2	.0	2	42	44	0	0	2	.0	51	1
2	25	63	2.2	13.8	7.5	.4	8	.8	1.4	.0	2	43	44	0	0	3	.0	58	*1
3	4	63	2.2	14.0	7.4	.3	8	.7	1.4	.0	2	44	45	0	1	2	.0	62	2
3	11	63	2.2	13.9	7.5	.4	7	.8	1.5	.0	2	43	44	0	0	3	.0	57	2
3	18	63	1.1	13.9	7.5	.3	8	.9	1.7	.0	2	44	45	0	0	3	.0	60	1
3	25	63	1.1	13.8	7.5	.3	6	.7	1.4	.0	2	43	44	0	0	4	.0	54	240
4	1	63	1.1	13.8	7.5	.3	10	.6	1.2	.0	2	42	44	0	0	4	.0	59	830
4	8	63	1.1	13.7	7.5	.3	8	.7	1.2	.0	2	42	44	0	0	2	.0	56	9
4	15	63	1.1	13.5	7.5	.4	7	.7	1.2	.0	2	42	44	0	0	3	.0	57	1
4	22	63	1.7	13.8	7.5	.3	7	.6	1.2	.0	2	43	45	0	0	3	.0	53	-
4	29	63	2.2	13.6	7.5	.4	8	.6	1.3	.0	2	43	44	0	0	2	.0	53	*1
5	6	63	2.8	13.7	7.5	.3	8	.6	1.4	.0	2	43	44	0	1	3	.0	56	6
5	13	63	2.2	13.6	7.5	.5	10	.7	1.7	.0	2	43	44	0	0	3	.0	54	-
5	21	63	3.3	13.5	7.5	.6	9	.8	1.6	.0	2	42	44	0	0	3	.0	53	*1
5	27	63	3.9	11.6	7.5	.3	11	.7	1.4	.0	2	43	44	0	0	3	.0	55	-
6	3	63	4.4	13.5	7.6	.4	12	.9	1.6	.0	2	43	44	0	0	3	.0	55	*1
6	11	63	3.9	13.4	7.5	.3	11	.9	1.3	.0	2	43	44	5	1	2	.0	53	10
6	17	63	4.4	13.3	7.4	.4	9	.7	1.4	.0	2	43	44	5	1	3	.0	52	1
6	24	63	5.6	13.2	7.4	.2	10	.8	1.4	.0	2	43	44	5	1	2	.0	60	5

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE MINNESOTA
MAJOR BASIN WESTERN GREAT LAKES
MINOR BASIN LAKE SUPERIOR
STATION LOCATION LAKE SUPERIOR AT DULUTH, MINNESOTA

10

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
7	1	63	5.0	13.4	7.6	.4	12	.8	1.7	.0	2	43	43	0	0	2	.0	49	-
7	8	63	5.6	13.0	7.4	.4	9	.8	1.7	.0	2	43	44	5	0	2	.0	56	5
7	15	63	4.4	13.8	7.4	.4	8	1.0	1.8	.0	2	43	44	0	0	2	.0	51	6
7	22	63	5.0	12.6	7.6	.4	5	.9	1.7	.0	2	43	44	0	0	2	.0	49	3
7	29	63	4.4	12.9	7.5	.7	8	.9	1.4	.0	2	42	44	0	0	3	.0	58	3
8	5	63	7.2	12.7	7.4	.5	10	.9	1.5	.0	2	43	44	0	0	2	.0	56	10
8	12	63	20.0	9.8	7.8	.6	9	.8	1.6	.0	2	42	44	5	1	4	.0	52	9
8	19	63	14.4	10.3	7.7	.5	9	.8	1.4	.0	2	42	43	5	2	3	.0	57	130
8	26	63	13.1	10.5	7.8	.4	10	.7	2.2	.0	2	43	44	0	1	3	.0	59	1
9	3	63	15.6	10.0	7.7	.4	10	.9	2.1	.0	2	42	44	0	1	3	.0	61	5
9	9	63	5.6	12.4	7.5	.4	9	.9	1.4	.0	2	43	44	0	0	2	.0	61	8
9	16	63	12.2	10.7	7.6	.3	10	.8	1.5	.0	2	44	44	0	3	3	.0	59	3
9	23	63	13.3	10.5	7.5	.5	11	.9	1.4	.0	2	43	44	0	.25	3	.0	53	19
9	30	63	12.2	10.8	7.5	.5	8	.7	1.5	.0	2	43	44	0	.25	3	.0	57	.1

STREAM FLOW DATA - 1962-1963

Thousand Cubic Feet per Second

PROVISIONAL--SUBJECT TO REVISION

Supplied by U.S. Army Corps of Engineers
U.S. Lake Survey

STATE Minnesota

MAJOR BASIN Western Great Lakes

MINOR BASIN Lake Superior

STATION LOCATION Lake Superior at Duluth, Minnesota

Day	October	November	December	January	February	March	April	May	June	July	August	September
			FLOW	DATA	NOT	APPLICABLE	---	LAKE	LEVELS	ONLY		

ST. CLAIR RIVER AT PORT HURON, MICHIGAN

The St. Clair River flows from Lake Huron to Lake St. Clair thence to Lake Erie via the Detroit River. Samples are collected at the Port Huron municipal water plant intake. This station is located at the beginning of the St. Clair River just above the mouth of the Black River.

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Station Location: St. Clair River at Port Huron, Michigan

Major Basin: Western Great Lakes

Minor Basin: St. Clair-Detroit Rivers

Station at: 42° 59' Latitude 82° 25' Longitude

Miles above mouth: 38

Activation Date: May 16, 1960

Sampled by: City of Port Huron, Michigan

Field Analysis by: City of Port Huron, Michigan

Other Cooperating Agencies: Michigan State Department of Health
Michigan State Water Resources Comm.
International Joint Commission

Hydrologic Data:

Nearest pertinent gaging station: Ft. Gratiot, Michigan

Gaging station operated by: U. S. Army Lake Survey

Drainage area at gaging station: —

Period of record: 1900 to present

Average discharge in record period: —

Maximum discharge in record period: —

Minimum discharge in record period: —

Remarks:

ALKYL BENZENE SULFONATE (ABS)

Date	mg/l

ELEMENTAL ANALYSES

		Composite Interval 10/1/62 to 12/31/62	Composite Interval 4/1/63 to 6/30/63
Analysis by wet or flame methods. Results in mg/l	F	.02	.10
	Na	3.0	3.7
	K	1.1	.9
Analysis by Spectrographic methods. Results in micrograms per liter	Zn	4	8
	Cd	*1	*1
	As	*11	*11
	B	12	14
	P	*0	*0
	Fe	53	3
	Mo	4	9
	Mn	.2	*.5
	Al	-	0
	Be	*.03	*.03
	Cu	13	15
	Ag	*.2	*.3
	Ni	*1	*1
	Co	*2	*1
	Pb	6	*4
	Cr	*1	*3
	V	*1	*6
	Ba	15	10
	Sr	42	39

*Actual value is less than the amount shown. Reported result indicates limit of sensitivity at which test was performed. See text for explanation.

STRONTIUM 90 ACTIVITY

Composite Interval	pc./l	±	Composite Interval	pc./l	±
October to December	.8	.2	April to June	1.3	.2
January to March	—	—	July to September	—	—

± at 95% Confidence Limits

SPECIFIC QUALITATIVE IDENTIFICATIONS FROM CARBON ADSORPTION EXTRACTS
WATER YEAR 1962-3

Interval	Compound	Concentration* ug/l

*Concentration values, where shown, are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE, and may be assigned the units of ug/l. In light of the unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.
See page 21.

RADIOACTIVITY DETERMINATIONS

STATE MICHIGAN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN ST. CLAIR-DETROIT RIVERS

STATION LOCATION ST. CLAIR RIVER AT PORT HURON, MICHIGAN 64

DATE SAMPLE TAKEN			RADIOACTIVITY IN WATER												RADIOACTIVITY IN PLANKTON					
			DATE OF DETERMINATION		ALPHA						BETA						GROSS ACTIVITY			
					SUSPENDED		DISSOLVED		TOTAL		SUSPENDED		DISSOLVED		TOTAL		ALPHA		BETA	
MO	DAY	YR	MO	DAY	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	MO. DAY	pc/g	±	pc/g	±
10	1	62	10	25	-	-	-	-	-	-	2	6	21	7	23	9					
10	9	62	12	13	-	-	-	-	-	-	1	6	1	7	2	9					
10	15	62	11	28	-	-	-	-	-	-	5	5	9	7	14	8					
10	23	62	11	16	0	0	1	1	1	1	11	6	2	7	13	9					
10	29	62	11	13	-	-	-	-	-	-	7	5	9	7	16	9					
11	26	62	12	12*	0	0	0	1	0	1	6	6	22	7	28	9					
12	31	62	1	16*	0	1	0	0	0	1	4	6	8	7	12	9					
1	28	63	2	21*	0	0	0	1	0	1	4	6	11	7	15	9					
2	25	63	3	11*	0	0	0	0	0	0	0	3	7	3	7	4					
3	25	63	4	16*	0	0	0	1	0	1	12	6	13	7	25	9					
4	29	63	5	22*	0	0	0	1	0	1	7	6	14	7	21	9					
5	27	63	6	19*	0	1	0	1	0	1	9	6	18	7	27	9					
6	24	63	7	24*	0	0	1	1	1	1	4	5	7	7	11	9					
7	29	63	8	21*	0	0	0	1	0	1	0	6	9	7	9	9					
8	26	63	9	25*	0	1	0	0	0	1	4	5	12	7	16	9					
9	30	63	10	31*	0	0	0	1	0	1	4	6	9	7	13	9					

PLANKTON POPULATION

STATE MICHIGAN
MAJOR BASIN WESTERN GREAT LAKES
MINOR BASIN ST. CLAIR-DETROIT RIVERS
STATION LOCATION ST. CLAIR RIVER AT PORT HURON, MICHIGAN

64

DATE OF SAMPLE			ALGAE (Number per milliliter)										MOST ABUNDANT ALGAE - Genera and Count Level per ml. (See text for Codes)																			
			TOTAL	BLUE-GREEN		GREEN		FLAGELLATED (Pigmented)		DIATOMS		INERT DIATOM SHELLS		1ST		2ND		3RD		4TH		5TH		6TH		7TH		8TH		9TH		10TH	
MONTH	DAY	YEAR		COCCOID	FILAMENTOUS	COCCOID	FILAMENTOUS	GREEN	OTHER	CENTRIC	PENNATE	CENTRIC	PENNATE	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL
10	1	62	400	30	0	140	0	0	10	70	150	210	120																			
10	15	62	400	0	0	30	0	0	10	180	170	70	0																			
11	5	62	500	0	0	0	0	0	0	170	290	210	40																			
11	19	62	2100	0	0	40	0	0	170	370	1550	80	80	84	2	61	1															
12	3	62	100	0	0	0	0	0	30	20	90	20	0																			
12	17	62	300	0	20	0	0	0	0	20	260	40	40																			
1	7	63	900	0	0	20	0	0	80	150	690	80	0																			
1	21	63	300	0	0	10	0	0	30	40	250	40	30																			
2	4	63	700	0	0	0	0	0	80	170	420	130	110																			
2	18	63	100	0	0	0	0	0	0	30	60	30	60																			
3	4	63	200	0	0	10	0	0	80	70	80	80	320																			
3	18	63	700	0	0	0	0	0	60	110	500	40	150	92	1																	
4	1	63	500	0	0	0	0	0	220	0	270	0	80																			
4	15	63	1300	0	0	0	0	0	150	40	1060	40	530	92	1	65	1	93	1	84	1											
5	6	63	800	0	0	40	0	0	0	40	750	70	440	92	2																	
5	20	63	1200	0	0	20	0	0	40	150	1030	20	60	92	2	93	1	77	1													
6	3	63	400	0	0	0	0	20	0	0	400	0	150	92	1																	
6	17	63	200	0	0	0	0	0	0	0	180	0	50																			
8	5	63	700	0	0	20	0	0	20	640	40	540	80																			
8	19	63	600	40	0	60	0	0	80	390	60	390	270																			
9	3	63	500	0	0	130	0	0	90	200	90	50	50																			
9	16	63	500	0	0	40	0	0	0	290	130	160	50																			

PLANKTON POPULATION

STATE MICHIGAN
MAJOR BASIN WESTERN GREAT LAKES
MINOR BASIN ST. CLAIR-DETROIT RIVERS
STATION LOCATION ST. CLAIR RIVER AT
PORT HURON, MICHIGAN 064

DATE OF SAMPLE			DOMINANT SPECIES OF DIATOMS AND PERCENT OF TOTAL DIATOMS (See text for Codes)									FUNGI AND SHEATHED BACTERIA Number per ml.	MICROINVERTEBRATES																					
			1ST		2ND		3RD		4TH				PROTOZOA (Identifiable) Number per ml.	ROTIFERS										CRUSTACEA								NEMATODES (Identifiable) Number per liter	OTHER ANIMAL FORMS (Number per liter)
														NUMBER PER LITER	GENERA AND COUNT LEVEL (See text for Codes)										NUMBER PER LITER	GENERA AND COUNT LEVEL (See text for Codes)									
															1ST		2ND		3RD		4TH		5TH			1ST		2ND		3RD			
MONTH	DAY	YEAR	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	OTHER SPECIES PERCENT				GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL		GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL		
10	1	62	45	26	58	18	83	11	57	9	36	0	0	30	22	2	17	1	11	1				4	76	1					0	0
10	15	62	25	45	47	24	24	7	46	3	21	0	0	0										0							0	0
11	5	62	25	27	46	26	47	18	48	5	24	0	0	1										0							0	0
11	19	62	46	59	25	9	47	6	56	5	21	0	0	0										2							0	0
12	3	62	62	24	47	12	16	6	9	6	52	0	0	1										0							0	0
12	17	62	25	24	77	16	9	15	47	7	38	110	0	1										0							0	0
1	7	63	47	23	9	16	77	15	35	13	33	0	0	0										3							0	0
1	21	63	9	25	95	12	47	12	27	8	43	170	0	2										0							0	0
2	4	63	47	41	9	17	95	11	89	7	24	0	0	0										1							0	0
2	18	63	95	23	9	21	47	20	91	15	21	0	0	3										1							0	0
3	4	63	95	38	47	24	91	7	9	5	26	0	-	4										6	76	2					0	0
3	18	63	95	25	47	22	91	14	92	10	29	-	-	0										1							0	0
4	1	63	95	39	47	13	92	8	25	7	33	-	-	1										1							0	0
4	15	63	47	35	95	16	91	11	35	11	27	-	-	11	5	1								24	76	4	77	1			0	0
5	6	63	95	47	92	15	56	11	47	10	17	-	-	5										1							0	0
5	20	63	95	51	92	10	91	7	56	4	28	-	-	-										-							-	-
6	3	63	95	36	91	14	9	8	92	7	35	-	-	-										-							-	-
6	17	63	9	16	89	16	77	9	60	8	51	-	-	-										-							-	-
8	5	63										-	-	-										-							-	-
8	19	63										-	-	-										-							-	-
9	3	63										-	-	-										-							-	-
9	16	63										-	-	-										-							-	-

ORGANIC CHEMICALS

RECOVERED BY CARBON FILTER TECHNIQUE

RESULTS IN MICROGRAMS PER LITER
(Parts per billion)

STATE MICHIGAN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN ST. CLAIR-DETROIT RIVERS

STATION LOCATION ST. CLAIR RIVER AT PORT HURON, MICHIGAN

64

DATE OF SAMPLE BEGINNING MONTH	DAY	YEAR	END MONTH	DAY	GALLONS FILTERED	EXTRACTABLES TOTAL	CHLORO-FORM	ALCOHOL	CHLOROFORM EXTRACTABLES ETHER INSOLUBLES	WATER SOLUBLES	NEUTRALS TOTAL	ALIPHATICS	AROMATICS	OXYGEN-ATED COMPOUNDS	LOSS	WEAK ACIDS	STRONG ACIDS	BASES	LOSS
10	25	62	11	15	5400#	111	19	92	0	5	7	1	1	5	0	2	1	0	4
12	7	62	12	26	5315	126	15	111	0	5	5	0	1	4	0	2	1	0	2
1	11	63	1	31	5120#	159	28	131	-	-	-	-	-	-	-	-	-	-	-
2	18	63	3	7	5175	157	31	126	2	10	9	1	1	6	1	4	1	1	4
3	29	63	4	11	3000#	168	38	130	-	-	-	-	-	-	-	-	-	-	-
4	29	63	5	14	3500#	105	21	84	1	7	6	1	1	4	0	3	1	0	3
6	3	63	6	22	5566#	144	35	109	-	-	-	-	-	-	-	-	-	-	-
7	11	63	7	30	5355	132	36	96	1	13	10	1	1	7	1	3	3	1	5
8	17	63	9	6	5400#	96	27	69	-	-	-	-	-	-	-	-	-	-	-
9	24	63	10	14	6075	127	15	112	0	5	4	0	0	4	0	2	1	0	3

ESTIMATED

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE MICHIGAN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN ST. CLAIR-DETROIT RIVERS

STATION LOCATION ST. CLAIR RIVER AT PORT HURON, MICHIGAN

64

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
10	1	62	16.5	10.2	8.3	.9	–	–	–	.1	7	94	98	5	2	8	–	–	16
10	8	62	17.0	9.8	8.3	.9	–	–	–	.1	7	96	98	5	2	10	–	96	–
10	9	62	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	60
10	10	62	15.5	10.2	8.3	.6	–	–	–	–	–	–	–	–	–	–	–	–	–
10	15	62	17.0	9.8	8.3	.9	–	–	–	.1	7	83	94	6	2	11	–	100	–
10	23	62	–	–	–	–	–	–	–	.1	7	92	98	6	3	10	–	101	38
10	29	62	11.0	10.7	8.3	1.7	–	–	–	–	–	–	–	–	–	–	–	–	20
11	5	62	11.0	11.7	8.4	1.0	–	–	–	.1	7	83	94	14	12	9	–	100	10
11	12	62	8.0	11.4	8.6	1.0	–	–	–	.1	6	83	99	6	7	11	–	132	4
11	19	62	9.0	12.5	8.1	2.1	–	–	–	.2	8	85	92	7	46	12	–	128	24
11	26	62	8.0	12.0	8.3	.4	–	–	–	.2	8	85	97	15	20	10	–	124	24
12	3	62	8.0	12.0	8.1	.5	9	–	–	.1	8	85	94	5	2	10	–	132	5
12	10	62	7.0	12.0	8.1	.4	8	–	–	.1	7	86	94	4	1	11	–	108	2
12	17	62	5.0	11.0	8.1	.6	9	–	–	–	8	82	93	6	6	10	–	116	*2
12	24	62	2.0	12.0	8.1	.6	9	–	–	.1	7	81	95	7	2	9	–	136	*2
12	31	62	2.0	12.3	8.1	2.1	10	–	–	.1	9	81	95	7	8	10	–	122	2
1	7	63	2.0	13.0	8.2	2.7	8	–	–	.1	9	82	96	7	4	10	–	136	*2
1	14	63	–	–	–	–	–	–	–	.1	8	83	93	5	1	10	–	112	*2
1	21	63	2.0	12.9	8.1	2.0	7	–	–	–	–	–	–	–	–	–	–	–	*2
1	28	63	1.0	13.7	8.1	1.8	8	–	–	.1	9	81	103	5	2	11	–	128	*2
2	4	63	1.0	13.5	8.1	2.1	–	–	–	.1	8	81	104	5	1	11	–	128	*2
2	11	63	1.0	13.7	8.0	2.2	8	–	–	.1	8	83	99	5	1	12	–	156	*10
2	18	63	2.0	13.8	8.0	2.0	9	–	–	.1	8	82	102	5	1	12	–	136	1
2	25	63	1.0	13.4	8.4	2.3	–	–	–	.1	9	82	102	5	0	11	–	136	1
3	4	63	1.0	13.1	8.0	2.0	–	–	–	.1	9	81	101	5	0	11	–	120	*2
3	11	63	2.0	12.4	8.0	2.1	8	–	–	.1	9	80	100	5	0	11	–	115	5
3	18	63	3.0	12.4	8.0	2.5	–	–	–	.1	9	82	102	5	0	11	–	110	*2
3	25	63	–	–	–	–	–	–	–	.1	9	81	105	4	1	12	–	101	70
3	29	63	4.0	13.4	8.0	3.0	9	–	–	.8	9	–	–	–	–	–	–	–	160
4	1	63	4.0	12.0	8.0	2.4	10	–	–	.1	9	80	108	5	1	11	–	100	–
4	8	63	7.0	11.5	8.0	2.7	9	–	–	.1	9	80	103	5	1	9	–	120	*2
4	15	63	7.0	11.8	8.0	2.5	10	–	–	.1	9	84	105	5	10	11	–	130	–
4	22	63	7.0	11.6	8.1	1.4	–	–	–	.1	9	85	104	4	4	12	–	140	*2
4	29	63	8.0	12.1	7.9	2.1	10	–	–	.1	9	84	100	4	6	9	–	112	20
5	6	63	9.0	11.3	8.0	2.1	–	–	–	.1	9	83	99	5	2	11	–	132	5
5	13	63	10.0	11.9	8.1	1.7	–	–	–	.1	9	81	100	7	38	10	–	100	2
5	20	63	11.0	11.4	7.9	1.4	–	–	–	.1	9	83	102	8	20	10	–	142	–
5	27	63	11.0	11.6	8.2	1.5	7	–	–	.1	9	80	99	7	7	10	–	144	–
											9	81	102	6	6	10	–	104	10

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE MICHIGAN
MAJOR BASIN WESTERN GREAT LAKES
MINOR BASIN ST. CLAIR-DETROIT RIVERS
STATION LOCATION ST. CLAIR RIVER AT PORT HURON, MICHIGAN

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DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (cobalt units)	TURBIDITY (silica units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
6	3	63	13.0	11.5	8.2	1.5	-	-	-	.1	9	80	102	5	4	10	-	100	*2
6	10	63	14.0	11.3	8.1	1.8	10	-	-	.1	9	82	101	3	4	9	-	100	*2
6	17	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
6	24	63	16.0	10.0	8.3	.4	-	-	-	.1	8	81	101	3	7	10	-	144	1
7	1	63	21.0	10.1	8.2	5.-	*	-	-	.1	9	80	102	4	1	9	-	140	5
7	8	63	19.0	9.3	8.3	-	-	-	-	.1	9	81	105	6	8	10	-	148	8
7	15	63	18.0	9.5	8.3	.8	8	-	-	.1	8	84	102	4	140	11	-	140	*2
7	22	63	21.0	9.1	8.3	.8	-	-	-	.1	8	80	101	4	2	12	-	-	5
7	29	63	23.0	9.1	8.1	.6	8	-	-	.1	9	81	105	4	1	10	-	152	22
8	5	63	21.0	8.9	8.3	.6	-	-	-	.1	10	81	107	4	7	12	-	128	34
8	12	63	22.0	9.1	8.3	.8	-	-	-	.1	10	80	104	5	1	11	-	142	40
8	19	63	21.0	8.9	8.3	.7	-	-	-	.1	9	81	101	5	8	9	-	116	80
8	26	63	20.0	9.2	8.3	.7	-	-	-	.1	9	82	104	7	15	9	-	100	80
9	3	63	20.0	9.1	8.3	-	-	-	-	.1	9	81	100	5	7	11	-	100	150
9	9	63	19.0	9.2	8.4	-	-	-	-	.1	9	83	102	5	6	12	-	128	18
9	16	63	18.0	9.2	8.3	-	-	-	-	.1	8	81	100	7	17	11	-	196	30
9	23	63	17.0	9.6	8.2	.7	-	-	-	.1	9	82	102	4	14	9	-	104	100
9	30	63	16.0	9.6	8.4	.4	-	-	-	.1	8	82	101	9	37	11	-	124	240

STREAM FLOW DATA - 1962-1963

Thousand Cubic Feet per Second

PROVISIONAL--SUBJECT TO REVISION

Supplied by U.S. Army Corps of Engineers
U.S. Lake Survey

STATE Michigan

MAJOR BASIN Western Great Lakes

MINOR BASIN St. Clair-Detroit Rivers

STATION LOCATION St. Clair River at
Port Huron, Michigan

Day	October	November	December	January	February	March	April	May	June	July	August	September
	181.000	175.000	171.000	141.000	140.000	160.000	168.000	171.000	173.000	174.000	174.000	171.000

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ST. MARY'S RIVER AT SAULT STE. MARIE, MICHIGAN

The St. Mary's River flows from Lake Superior to Lake Huron and is on the boundary between Canada and the United States. Samples are collected from the municipal water treatment plant intake. This point is near the outlet of Lake Superior approximately two miles above the navigation locks at Sault Ste. Marie.

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Station Location: St. Mary's River at Sault Ste. Marie, Michigan

Major Basin: Western Great Lakes

Minor Basin: Lake Superior

Station at: 46° 30' Latitude 84° 25' Longitude

Miles above mouth: 48

Activation Date: November 9, 1959

Sampled by: Sault Ste. Marie Water Department

Field Analysis by: Sault Ste. Marie Water Department

Other Cooperating Agencies: Michigan State Department of Health

Hydrologic Data:

Nearest pertinent gaging station: Sault Ste. Marie, Michigan (lake levels only)

Gaging station operated by: U. S. Army Lake Survey

Drainage area at gaging station: —

Period of record: 1900 to present

Average discharge in record period: —

Maximum discharge in record period: —

Minimum discharge in record period: —

Remarks:

ALKYL BENZENE SULFONATE (ABS)

Date	mg/l

ELEMENTAL ANALYSES

		Composite Interval 10/1/62 to 12/31/62	Composite Interval 4/1/63 to 6/30/63
Analysis by wet or flame methods. Results in mg/l	F	.15	.05
	Na	6.2	1.9
	K	.9	.4
Analysis by Spectro-graphic method. Results in micrograms per liter	Zn	406	2
	Cd	*1	*1
	As	*12	*5
	B	13	8
	P	33	*3
	Fe	168	3
	Mo	*1	*1
	Mn	.6	*.3
	Al	-	3
	Be	*.03	*.01
	Cu	28	6
	Ag	*.2	*.1
	Ni	28	*1
	Co	*2	*1
	Pb	*6	*2
	Cr	*1	*1
	V	*1	*3
	Ba	34	6
	Sr	19	13

*Actual value is less than the amount shown. Reported result indicates limit of sensitivity at which test was performed. See text for explanation.

STRONTIUM 90 ACTIVITY

Composite Interval	pc/l	±	Composite Interval	pc/l	±
October to December	.8	.2	April to June	—	—
January to March	—	—	July to September	1.5	.3

± at 95% Confidence Limits

SPECIFIC QUALITATIVE IDENTIFICATIONS FROM CARBON ADSORPTION EXTRACTS WATER YEAR 1962-3

Interval	Compound	Concentration* ug/l

*Concentration values, where shown, are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE, and may be assigned the units of ug/l. In light of the unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.
See page 21.

RADIOACTIVITY DETERMINATIONS

STATE MICHIGAN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN LAKE SUPERIOR

STATION LOCATION ST. MARYS RIVER AT SAULT STE. MARIE, MICHIGAN 66

DATE SAMPLE TAKEN			RADIOACTIVITY IN WATER														RADIOACTIVITY IN PLANKTON					
			DATE OF DETERMINATION		ALPHA						BETA						DATE OF DETERMINATION		GROSS ACTIVITY			
					SUSPENDED		DISSOLVED		TOTAL		SUSPENDED		DISSOLVED		TOTAL				ALPHA		BETA	
MO	DAY	YR	MO	DAY	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	MO.	DAY	pc/g	±	pc/g	±
10	1	62	11	2	-	-	-	-	-	-	0	6	4	6	4	8						
10	8	62	11	7	-	-	-	-	-	-	0	5	7	5	7	7						
10	15	62	12	20	-	-	-	-	-	-	3	5	9	6	12	8						
10	22	62	11	23	0	0	1	1	1	1	6	5	9	5	15	7						
10	29	62	11	21	-	-	-	-	-	-	5	6	14	6	19	8						
11	26	62	12	21*	0	0	0	0	0	0	3	6	8	6	11	8						
12	31	62	1	18*	0	0	0	0	0	0	6	6	6	6	12	8						
1	28	63	2	21*	1	1	0	0	1	1	1	6	10	6	11	8						
2	25	63	3	18*	0	0	0	0	0	0	1	3	6	3	7	4						
3	25	63	4	17*	0	0	0	0	0	0	2	6	10	6	12	8						
4	29	63	5	24*	0	0	0	0	0	0	4	6	11	6	15	8						
5	27	63	6	19*	0	1	0	0	0	1	2	6	7	6	9	8						
6	24	63	7	24*	0	0	0	0	0	0	5	5	13	6	18	8						
7	29	63	8	21*	0	1	0	1	0	1	2	5	13	6	15	8						
8	26	63	10	1*	0	0	0	1	0	1	5	3	12	4	17	5						
9	30	63	10	31*	0	0	1	1	1	1	1	5	5	6	6	8						

PLANKTON POPULATION

STATE MICHIGAN
MAJOR BASIN WESTERN GREAT LAKES
MINOR BASIN LAKE SUPERIOR
STATION LOCATION ST. MARYS RIVER AT
SAULT STE. MARIE, MICHIGAN 66

DATE OF SAMPLE			ALGAE (Number per milliliter)								INERT DIATOM SHELLS		MOST ABUNDANT ALGAE - Genera and Count Level per ml. (See text for Codes)																	
			TOTAL	BLUE-GREEN		GREEN		FLAGELLATED (Pigmented)		DIATOMS			1ST		2ND		3RD		4TH		5TH		6TH		7TH		8TH		9TH		10TH	
MONTH	DAY	YEAR		COCCOID	FILAMENTOUS	COCCOID	FILAMENTOUS	GREEN	OTHER	CENTRIC	PENNATE	CENTRIC	PENNATE	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL
10	1	62	200	0	0	90	0	0	20	50	50	270	770																		
10	15	62	100	10	0	0	0	0	0	30	60	10	0																		
11	5	62	3300	0	0	0	0	0	0	410	2840	40	210	87	3	81	2	93	1	77	1	73	1	97	1	88	1				
11	19	62	200	0	0	0	0	0	40	40	170	0	0																		
12	3	62	100	20	20	0	0	0	0	20	90	30	60																		
12	17	62	200	0	20	0	0	0	0	60	110	0	1030																		
1	7	63	400	0	0	0	0	0	0	20	340	20	150																		
1	21	63	300	0	0	10	0	0	120	40	140	0	40																		
2	4	63	100	0	0	10	0	0	0	0	60	60	60																		
2	18	63	00	0	0	0	0	0	0	0	30	0	30																		
3	4	63	200	0	210	0	0	10	0	0	0	0	60	11	1																
3	18	63	00	0	0	0	0	0	0	0	10	0	0																		
4	1	63	00	0	0	0	0	0	0	0	50	0	30																		
4	15	63	00	0	0	0	0	0	0	0	20	0	30																		
5	6	63	200	0	0	150	0	0	0	0	20	0	10																		
5	20	63	400	0	0	40	0	0	40	20	270	0	230																		
6	3	63	100	0	0	0	0	0	0	40	90	0	180																		
6	17	63	500	0	50	0	0	0	50	140	270	0	140																		
8	5	63	800	0	0	150	0	0	0	110	550	90	460																		
8	19	63	100	20	0	20	0	0	0	60	0	80	0																		
9	2	63	200	0	0	40	0	0	0	160	50	0	0																		
9	16	63	100	70	0	20	0	0	0	50	0	0	50																		

PLANKTON POPULATION

STATE MICHIGAN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN LAKE SUPERIOR

STATION LOCATION ST. MARYS RIVER AT SAULT STE. MARIE, MICHIGAN 066

DATE OF SAMPLE			DOMINANT SPECIES OF DIATOMS AND PERCENT OF TOTAL DIATOMS (See text for Codes)									FUNGI AND SHEATHED BACTERIA Number per ml	MICROINVERTEBRATES																			
			1ST		2ND		3RD		4TH				PROTOZOA (Identifiable) Number per ml	ROTIFERS										CRUSTACEA							NEMATODES (Identifiable) Number per liter	OTHER ANIMAL FORMS (Number per liter)
															GENERA AND COUNT LEVEL (See text for Codes)												GENERA AND COUNT LEVEL (See text for Codes)								
MONTH	DAY	YEAR	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	OTHER SPECIES PERCENT			NUMBER PER LITER	1ST		2ND		3RD		4TH		5TH		NUMBER PER LITER	1ST		2ND		3RD			
															GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL		GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL		
10	1	62	95	36	24	20	47	4	83	3	37	0	0	15	11	1									3	51	1					0	1
10	15	62	95	10	25	8	9	8	2	6	68	0	0	11	11	1									3	51	1					0	0
11	5	62	24	13	95	9	9	8	25	6	64	0	0	0											0							0	0
11	19	62	9	17	47	13	95	13	96	8	49	0	0	0											0							0	0
12	3	62	9	15	47	14	24	7	95	5	59	30	0	2											0							0	0
12	17	62	95	20	47	8	9	7	3	7	58	0	0	0											0							0	0
1	7	63	95	26	47	12	9	9	91	5	48	0	0	0											0							0	0
1	21	63	95	20	47	11	89	10	77	9	50	30	0	0											0							0	0
2	4	63	95	19	92	10	77	9	9	8	54	0	0	0											0							0	0
2	18	63	95	15	77	14	9	11	47	7	53	0	0	0											0							0	0
3	4	63	95	34	47	7	91	6	9	6	47	-	0	0											1							0	0
3	18	63	95	25	9	8	92	6	91	6	55	-	0	1											0							0	0
4	1	63	95	13	2	7	9	7	47	7	66	-	-	0											0							0	0
4	15	63	95	26	9	9	77	7	60	6	52	-	-	1											0							0	0
5	6	63	9	14	77	12	95	11	91	9	54	-	-	-											-							-	-
5	20	63	9	13	95	9	92	8	31	5	65	-	-	-											-							-	-
6	3	63	77	18	95	17	91	16	9	12	37	-	-	-											-							-	-
6	17	63	26	17	49	13	9	12	47	8	50	-	-	-											-							-	-
8	5	63										-	-	-											-							-	-
8	19	63										-	-	-											-							-	-
9	2	63										-	-	-											-							-	-
9	16	63										-	-	-											-							-	-

ORGANIC CHEMICALS

RECOVERED BY CARBON FILTER TECHNIQUE

RESULTS IN MICROGRAMS PER LITER
(Parts per billion)

STATE MICHIGAN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN LAKE SUPERIOR

STATION LOCATION ST. MARYS RIVER AT SAULT STE. MARIE, MICHIGAN 66

DATE OF SAMPLE BEGINNING MONTH	BEGINNING DAY	BEGINNING YEAR	END MONTH	END DAY	GALLONS FILTERED	EXTRACTABLES TOTAL	EXTRACTABLES CHLORO-FORM	EXTRACTABLES ALCOHOL	CHLOROFORM EXTRACTABLES ETHER INSOLUBLES	CHLOROFORM EXTRACTABLES WATER SOLUBLES	CHLOROFORM EXTRACTABLES NEUTRALS TOTAL	NEUTRALS ALIPHATICS	NEUTRALS AROMATICS	NEUTRALS OXYGEN-ATED COMPOUNDS	NEUTRALS LOSS	CHLOROFORM EXTRACTABLES WEAK ACIDS	CHLOROFORM EXTRACTABLES STRONG ACIDS	CHLOROFORM EXTRACTABLES BASES	CHLOROFORM EXTRACTABLES LOSS
10	1	62	10	15	4868	80	12	68	-	-	-	-	-	-	-	-	-	-	-
11	1	62	11	13	4024	97	11	86	-	-	-	-	-	-	-	-	-	-	-
12	2	62	12	14	4283	73	6	67	-	-	-	-	-	-	-	-	-	-	-
12	2	62		*	13175	82	9	73	1	3	2	0	0	2	0	1	1	0	1
12	31	62	1	14	4440	121	15	106	-	-	-	-	-	-	-	-	-	-	-
2	4	63	2	18	3547	165	23	142	2	8	7	2	1	4	0	1	1	0	4
3	5	63	3	18	4552	124	18	106	-	-	-	-	-	-	-	-	-	-	-
4	1	63	4	15	5002	106	28	78	1	10	8	2	1	4	1	2	1	0	6
5	6	63	5	20	4095	151	40	111	-	-	-	-	-	-	-	-	-	-	-
6	3	63	6	17	2959	208	47	161	3	18	6	1	1	4	0	6	5	0	9
7	1	63	7	15	2460	267	67	200	-	-	-	-	-	-	-	-	-	-	-
8	5	63	8	19	4586	109	41	68	2	15	7	1	1	5	0	3	4	1	9
9	2	63	9	16	4024	109	35	74	-	-	-	-	-	-	-	-	-	-	-

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE MICHIGAN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN LAKE SUPERIOR

STATION LOCATION ST. MARYS RIVER AT SAULT STE. MARIE, MICHIGAN 66

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (cobalt units)	TURBIDITY (silica units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
10	1	62	11.1	10.2	8.0	-	5	.5	1.2	.1	2	42	45	0	-	-	.0	-	14
10	8	62	13.6	10.4	7.8	-	6	.5	1.0	.1	2	41	45	0	-	-	.4	-	13
10	15	62	12.5	10.7	7.8	-	5	.5	1.1	.1	2	41	45	0	-	-	.0	-	11
10	22	62	10.6	11.1	7.8	-	6	.5	1.1	.1	2	42	46	0	-	-	.0	-	68
10	29	62	8.5	11.6	7.9	-	6	.3	.8	.1	2	42	46	0	-	-	.0	-	7
11	5	62	7.8	11.8	8.0	-	5	.4	.8	.1	2	42	46	0	-	-	.0	-	35
11	12	62	7.1	12.0	7.9	-	6	.4	1.0	.1	2	42	45	0	-	-	.0	-	*1
11	19	62	6.7	12.2	7.9	-	6	.4	1.0	.1	2	41	45	0	-	-	.0	-	3
11	26	62	5.6	12.6	7.9	-	5	.4	1.0	.1	2	42	45	0	-	-	.0	-	3
12	3	62	6.0	12.0	7.9	-	5	.4	.9	.1	2	41	45	0	-	-	.0	-	5
12	10	62	2.1	12.4	7.9	-	6	.3	.8	.1	2	38	45	0	-	-	.0	-	10
12	17	62	2.1	12.2	7.8	-	5	.5	.9	.1	2	42	45	0	-	-	.0	-	3
12	24	62	.5	13.0	7.7	-	6	.5	.9	.1	2	43	46	0	-	-	.0	-	1
12	31	62	.2	12.8	7.6	-	5	.6	1.0	.1	2	42	46	0	-	-	.0	-	8
1	7	63	.9	13.0	7.3	-	5	.5	.9	.1	2	42	46	0	-	-	.0	-	12
1	14	63	.2	13.6	7.4	-	5	.5	.9	.1	2	42	46	0	-	-	.0	-	3
1	21	63	.1	13.7	7.5	-	6	.5	.9	.1	2	43	46	0	-	-	.0	-	8
1	28	63	.0	13.7	7.5	-	5	.5	1.1	.1	2	43	46	0	-	-	.0	-	6
2	4	63	.0	13.8	7.5	-	5	.5	.9	.1	2	43	46	0	-	-	.0	-	6
2	11	63	.0	13.9	7.5	-	5	.5	1.0	.1	2	42	47	0	-	-	.0	-	*1
2	18	63	.0	13.9	7.5	-	5	.5	.9	.1	2	42	47	0	-	-	.0	-	7
2	25	63	.0	13.8	7.5	-	5	.5	.9	.1	2	42	47	0	-	-	.0	-	6
3	4	63	.0	13.4	7.5	-	5	.5	1.1	.1	2	42	46	0	-	-	.0	-	10
3	11	63	.0	13.8	7.4	-	5	.5	1.1	.1	2	43	46	0	-	-	.0	-	12
3	18	63	.8	13.9	7.5	-	6	.5	1.0	.1	2	42	47	0	-	-	.0	-	4
3	25	63	.8	13.9	7.5	-	6	.5	1.3	.1	2	41	46	0	-	-	.0	-	5
4	1	63	.9	14.0	7.5	-	7	.5	1.2	.1	1	41	46	0	-	-	.0	-	7
4	8	63	1.7	13.5	7.4	-	5	.6	1.2	.1	2	39	43	5	-	-	.0	-	520
4	15	63	2.2	13.4	7.5	-	6	.5	1.2	.1	1	40	45	0	-	-	.0	-	15
4	22	63	2.7	13.5	7.5	-	6	.5	1.0	.1	2	41	45	0	-	-	.0	-	50
4	29	63	4.2	13.0	7.7	-	7	.6	1.5	.1	2	40	45	0	-	-	.0	-	5
5	6	63	4.4	13.1	7.7	-	6	.5	1.2	.1	2	40	45	0	-	-	.0	-	3
5	13	63	4.4	13.1	7.7	-	5	.5	1.0	.1	1	41	45	0	-	-	.0	-	-
5	20	63	5.4	12.6	7.6	-	6	.5	1.1	.1	2	41	45	0	-	-	.0	-	-
5	27	63	6.2	12.6	7.7	-	6	.5	1.2	.1	1	40	45	0	-	-	.0	-	1
6	3	63	5.1	12.5	7.7	-	6	.6	1.5	.1	1	42	45	0	-	-	.0	-	11
6	10	63	8.0	12.6	7.8	-	6	.5	1.1	.1	1	42	45	0	-	-	.0	-	2
6	17	63	9.1	12.5	7.8	-	5	.5	1.3	.1	2	41	46	0	-	-	.0	-	5
6	24	63	11.0	11.7	7.8	-	6	.5	1.5	.1	1	42	46	0	-	-	.0	-	5

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE MICHIGAN

MAJOR BASIN WESTERN GREAT LAKES

MINOR BASIN LAKE SUPERIOR

STATION LOCATION ST. MARYS RIVER AT SAULT STE. MARIE, MICHIGAN 66

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
7	1	63	13.6	11.2	7.8	-	6	.6	1.6	.1	2	43	46	0	-	-	.0	-	[illegible]
7	8	63	19.5	10.7	7.8	-	5	.6	1.2	.1	2	42	46	0	-	-	.0	-	1[illegible]
7	15	63	19.3	10.1	7.9	-	5	.4	.8	.1	2	42	46	0	-	-	.0	-	1[illegible]
7	22	63	16.1	10.0	7.8	-	5	.6	1.4	.1	2	41	46	0	-	-	.0	-	24
7	29	63	18.4	9.4	7.8	-	5	.6	1.4	.1	2	42	46	0	-	-	.0	-	41
8	5	63	17.6	9.5	7.8	-	5	.6	1.6	.1	2	41	46	0	-	-	.0	-	10
8	12	63	18.5	9.3	7.8	-	5	.6	1.6	.1	2	41	46	0	-	-	.0	-	14
8	19	63	15.4	9.8	7.8	-	6	.6	1.5	.1	2	41	46	0	-	-	.0	-	20
8	26	63	17.1	9.8	7.8	-	6	.6	1.3	.1	2	41	46	0	-	-	.0	-	20
9	2	63	16.8	9.8	7.9	-	5	.6	1.4	.1	2	42	46	0	-	-	.0	-	18
9	9	63	16.0	10.0	7.9	-	5	.6	1.4	.1	2	41	46	0	-	-	.0	-	15
9	16	63	13.8	10.3	7.8	-	6	.6	1.5	.1	2	42	46	0	-	-	.0	-	2[illegible]
9	23	63	12.8	10.6	7.9	-	5	.5	1.2	.1	2	42	46	0	-	-	.0	-	2[illegible]
9	30	63	11.4	10.9	7.9	-	5	.6	1.1	.1	2	41	46	0	-	-	.0	-	2[illegible]
								.6	1.5	.1	2	41	46	0	-	-	.0	-	24

STREAM FLOW DATA - 1962-1963

Thousand Cubic Feet per Second

PROVISIONAL--SUBJECT TO REVISION

Supplied by U.S. Army Corps of Engineers
U.S. Lake Survey

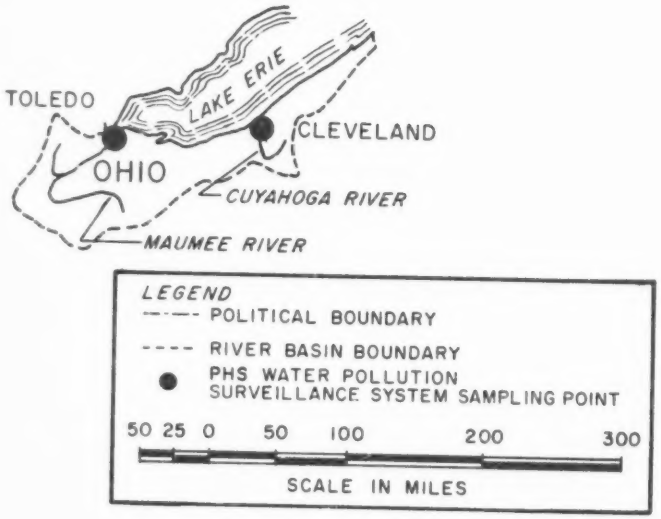
STATE: Michigan

MAJOR BASIN: Western Great Lakes

MINOR BASIN: Lake Superior

STATION LOCATION: St. Marys River at Sault Ste. Marie, Michigan

Day	October	November	December	January	February	March	April	May	June	July	August	September
	64.000	64.000	64.000	64.000	60.000	60.000	57.000	64.000	61.000	61.000	61.000	72.000



BASIN 6

LAKE ERIE

The Lake Erie basin includes about 14,065 square miles of which 11,660 are in northern Ohio and the balance is divided between Michigan, Indiana, and Pennsylvania. Three major rivers empty into Lake Erie; of these, the Maumee and Cuyahoga are included with the PHS Water Pollution Surveillance System.

Average monthly temperatures vary from the 20's in January to the 70's in July. Annual precipitation varies from about 28 to 40 inches, with a basinwide average of 35 inches.

The basin includes a number of heavily industrialized cities, a highly developed agricultural activity based largely upon vineyards and orchards, a commercial fishery, and a number of lakeshore recreational developments.

The Maumee River at Toledo has relatively high summer temperatures, high levels of dissolved phosphate and hard water, all of which favor a rich and diverse plankton flora. In contrast, the waters of the Cuyahoga River at Cleveland support very low plankton populations. This may be due to low phosphate levels although zinc is often present at this station in concentrations which are known to be inhibitory to algal growth.

The algae of these two rivers are dominated by diatoms. The most abundant pennate diatom is *Synedra ulna*. The most abundant centrics are *Stephanodiscus hantzschii* and *Melosira granulata*.

Rotifer populations of several hundred per liter have been observed in samples from Toledo which generally has had high phytoplankton counts. These rotifer populations consisted largely of *Synchaeta*.

CUYAHOGA RIVER AT CLEVELAND, OHIO

This station is approximately one mile above the point where the Cuyahoga River flows into the eastern end of Lake Erie. Samples are collected from the bridge tender's tower of Center Street Bridge.

The cities of Akron and Cleveland discharge, to the Cuyahoga, secondary sewage treatment plant effluents from a connected population of an estimated 825,000. There is a complex of chemical, automotive, paper and meat packing industries in the Cleveland area that discharge wastes into the river. The principal agricultural activity in the watershed is dairy farming. Lake Erie is the water supply for the city of Cleveland and serves a population 1,600,000.

The total dissolved solids concentration at this station varies widely and increased from approximately 200 ppm to 700 ppm over the six months period between April and September 1963. The station also shows high concentrations of zinc and boron and is one of the few in the country where cadmium has been found.

Station Location: Cuyahoga River at Cleveland, Ohio

Major Basin: Lake Erie

Minor Basin: Cuyahoga River

Station at: 41° 29' Latitude 81° 42' Longitude

Miles above mouth: 1

Activation Date: December 12, 1962

Sampled by: Cleveland Department of Public Utilities

Field Analysis by: Cleveland Department of Public Utilities
U. S. Public Health Service

Other Cooperating Agencies: Ohio Department of Health
U. S. Geological Survey

Hydrologic Data:

Nearest pertinent gaging station: Cuyahoga River at Independence, Ohio
Ohio Canal at Independence, Ohio

Gaging station operated by: U. S. Geological Survey

Drainage area at gaging station: 709 square miles

Period of record: 1921-1923; 1927-1933; 1940 to present

Average discharge in record period: See remarks

Maximum discharge in record period: —

Minimum discharge in record period: —

Remarks: Flow at Cleveland computed as sum of Cuyahoga River at Independence, Ohio plus Ohio Canal at Independence, Ohio. Average discharge estimated at 758 cfs in river plus 72 cfs in canal for total of 830 cfs.

ALKYL BENZENE SULFONATE (ABS)

Date	mg/l

ELEMENTAL ANALYSES

		Composite Interval 10/1/62 to 12/31/62	Composite Interval 4/1/63 to 6/30/63
Analysis by wet or flame methods. Results in mg/l	F	-	1.3
	Na	-	76
	K	-	9
Analysis by Spectrographic methods. Results in micrograms per liter	Zn	-	324
	Cd	-	6
	As	-	*50
	B	-	428
	P	-	30
	Fe	-	35
	Mo	-	30
	Mn	-	27
	Al	-	*30
	Be	-	*.2
	Cu	-	6
	Ag	-	*2
	Ni	-	15
	Co	-	*6
	Pb	-	*15
	Cr	-	15
	V	-	*30
	Ba	-	50
	Sr	-	207

*Actual value is less than the amount shown. Reported result indicates limit of sensitivity at which test was performed. See text for explanation.

STRONTIUM 90 ACTIVITY

Composite Interval	pc/l	±	Composite Interval	pc/l	±
October to December	—	—	April to June	—	—
January to March	1.4	.3	July to September	5.3	.4

± at 95% Confidence Limits

SPECIFIC QUALITATIVE IDENTIFICATIONS FROM CARBON ADSORPTION EXTRACTS WATER YEAR 1962-3

Interval	Compound	Concentration* ug/l

*Concentration values, where shown, are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE, and may be assigned the units of ug/l. In light of the unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.
See page 21.

RADIOACTIVITY DETERMINATIONS

STATE OHIO

MAJOR BASIN LAKE ERIE

MINOR BASIN CUYAHOGA RIVER

STATION LOCATION CUYAHOGA RIVER AT CLEVELAND, OHIO

DATE SAMPLE TAKEN			RADIOACTIVITY IN WATER												RADIOACTIVITY IN PLANKTON					
			DATE OF DETERMINATION	ALPHA					BETA						DATE OF DETERMINATION	GROSS ACTIVITY				
				SUSPENDED		DISSOLVED		TOTAL	SUSPENDED		DISSOLVED		TOTAL			ALPHA		BETA		
MO.	DAY	YR.	MO. DAY	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	MO. DAY	pc/g	±	pc/g	±
12	12	62	1 9	0	2	0	2	0	2	16	31	59	26	75	33					
12	19	62	1 3	1	2	0	1	1	2	9	29	44	32	53	41					
12	26	62	1 11	0	1	0	3	0	3	14	10	60	16	74	19					
1	2	63	1 [illegible]	1	1	1	1	2	1	3	5	41	6	44	10					
1	9	63	1 23	0	2	0	2	0	3	1	24	48	31	49	39					
1	16	63	1 29	0	1	1	2	1	3	8	22	66	19	74	22					
1	23	63	2 5	0	0	0	1	0	1	5	6	16	8	21	10					
1	30	63	2 19	0	1	0	1	0	1	11	5	26	9	37	11					
2	6	63	3 18	0	0	2	2	2	2	7	3	40	4	47	4					
2	13	63	3 4	0	0	0	1	0	1	4	3	17	4	21	5					
2	27	63	3 19	0	1	0	1	0	1	0	6	14	8	14	8					
3	6	63	3 27	1	1	0	1	1	1	77	14	110	17	187	22					
3	13	63	3 28	14	7	7	2	21	7	131	33	60	8	191	34					
3	20	63	4 4	6	5	0	1	6	5	290	43	65	9	355	43					
3	27	63	4 11	1	1	2	2	3	2	43	13	60	10	103	21					
4	3	63	4 18	6	2	2	3	8	4	8	11	36	16	30	19					
4	10	62	4 25	1	1	1	2	2	2	16	13	114	15	130	22					
4	17	63	5 1	1	1	2	3	3	3	3	12	42	17	45	21					
4	24	63	5 15	0	1	0	1	0	1	9	12	98	20	107	22					
5	1	63	5 17	0	1	1	2	1	2	15	12	70	15	85	22					
5	8	63	5 27	1	1	1	2	2	2	13	6	64	8	77	10					
5	15	63	7 11	1	1	0	2	1	2	8	7	50	10	58	12					
5	22	63	6 5	0	2	1	4	1	4	27	29	70	12	97	41					
5	29	63	6 12	0	2	0	1	0	2	19	23	75	32	94	39					
6	5	63	7 17	1	2	0	2	1	3	6	11	82	15	88	19					
6	12	63	8 24	0	2	1	3	1	4	0	42	92	39	92	51					
6	19	63	7 1	1	1	2	4	3	4	10	6	60	29	70	30					
6	26	63	7 10	0	1	0	2	0	2	11	6	30	35	41	35					
7	3	63	7 17	0	0	0	1	0	1	15	6	63	33	75	34					
7	14	63	7 31	0	1	1	4	1	4	15	12	58	30	73	32					
7	17	62	8 7	0	0	0	2	0	2	9	6	34	37	43	37					
7	24	63	8 13	0	1	2	4	2	4	4	6	39	15	43	16					
7	31	63	8 22	1	1	0	1	1	1	18	6	60	9	78	11					
8	7	63	8 21	1	1	0	2	1	2	8	6	46	29	54	30					
8	14	63	8 27	2	2	1	3	3	4	27	27	55	29	82	40					
8	21	63	9 30	2	2	1	3	3	3	4	10	26	24	30	26					
8	28	63	8 17	0	0	0	2	0	2	3	5	10	30	33	30					
9	4	63	9 23	0	1	0	5	4	5	7	6	45	15	52	16					
9	11	63	10 1	0	0	0	4	0	4	5	3	12	39	17	38					
9	18	63	10 8	0	1	2	1	0	1	2	11	56	20	58	22					
9	25	63	10 8	1	1	3	5	4	5	3	6	12	31	15	32					

PLANKTON POPULATION

STATE OHIO
MAJOR BASIN LAKE ERIE
MINOR BASIN CUYAHOGA RIVER
STATION LOCATION CUYAHOGA RIVER AT CLEVELAND, OHIO

126

DATE OF SAMPLE			ALGAE (Number per milliliter)									INERT DIATOM SHELLS		MOST ABUNDANT ALGAE - Genera and Count Level per ml. (See text for Codes)																	
			TOTAL	BLUE-GREEN		GREEN		FLAGELLATED (Pigmented)		DIATOMS				1ST		2ND		3RD		4TH		5TH		6TH		7TH		8TH		9TH		10TH	
MONTH	DAY	YEAR		COCCOID	FILAMENTOUS	COCCOID	FILAMENTOUS	GREEN	OTHER	CENTRIC	PENNATE	CENTRIC	PENNATE	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL
12	12	62	200	0	0	40	0	0	0	80	40	0	0																		
1	2	63	100	0	0	30	0	0	0	60	50	20	0																		
2	6	63	100	0	0	40	0	0	20	20	20	0	20																		
2	18	63	1100	0	0	0	0	110	370	370	260	70	20	62	2	77	1														
3	6	63	100	0	10	10	0	40	0	10	60	0	10																		
3	21	63	100	0	0	0	0	0	0	20	60	0	90																		
4	3	63	700	0	0	20	0	20	590	0	20	0	20	65	2																
4	17	63	200	0	0	20	0	20	0	90	90	70	40																		
5	1	63	100	0	0	20	0	0	0	20	80	0	0																		
5	15	63	400	0	60	60	0	30	0	110	100	0	40																		
5	29	63	200	0	0	40	0	0	0	40	100	0	0																		
6	19	63	1700	0	80	1170	0	240	0	90	140	0	30	26	3	57	1														
8	7	63	800	70	0	350	0	50	0	150	50	100	150																		
8	21	63	400	0	20	130	0	0	0	150	90	20	70																		
9	4	63	800	20	0	220	0	40	20	370	160	0	20																		
9	18	63	200	0	0	50	0	70	0	50	50	0	0																		

PLANKTON POPULATION

STATE OHIO

MAJOR BASIN LAKE ERIE

MINOR BASIN CUYAHOGA RIVER

STATION LOCATION CUYAHOGA RIVER AT CLEVELAND, OHIO 126

DATE OF SAMPLE			DOMINANT SPECIES OF DIATOMS AND PERCENT OF TOTAL DIATOMS (See test for Codes)									FUNGI AND SHEATHED BACTERIA Number per ml.	MICROINVERTEBRATES																			
			1ST		2ND		3RD		4TH				PROTOZOA (Identifiable) Number per ml.	ROTIFERS										CRUSTACEA								NEMATODES (Identifiable) Number per liter	OTHER ANIMAL FORMS (Number per liter)
														NUMBER PER LITER	GENERA AND COUNT LEVEL (See test for Codes)										NUMBER PER LITER	GENERA AND COUNT LEVEL (See test for Codes)									
															1ST		2ND		3RD		4TH		5TH			1ST		2ND		3RD			
MONTH	DAY	YEAR	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	SPECIES	PERCENT	OTHER SPECIES PERCENT				GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL		GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL		
12	12	62	82	34	57	17	26	11	91	7	31	60		0										0							0	0
1	2	63	59	62	46	12	80	5	56	5	16			1										0							0	0
2	6	63	59	26	9	22	82	21	80	10	21			3										0							0	0
2	18	63	82	33	59	26	9	25	35	9	7			1										2							0	0
3	6	63	92	47	65	12	56	5	26	3	33			1										0							18	0
3	21	63												0										0							0	0
4	3	63																														
4	17	63												0										0							0	0
5	1	63	82	17	70	13	56	9	26	8	53			0										0							0	0
5	15	63										10																				
5	29	63																														
6	19	63																														
8	7	63																														
8	21	63																														
9	4	63																														
9	18	63																														

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ORGANIC CHEMICALS

RECOVERED BY CARBON FILTER TECHNIQUE

RESULTS IN MICROGRAMS PER LITER
(Parts per billion)

STATE OHIO
MAJOR BASIN LAKE ERIE
MINOR BASIN CUYAHOGA RIVER
STATION LOCATION CUYAHOGA RIVER AT CLEVELAND, OHIO

126

DATE OF SAMPLE BEGINNING			DATE OF SAMPLE END		GALLONS FILTERED	EXTRACTABLES			CHLOROFORM EXTRACTABLES									
											NEUTRALS							
MONTH	DAY	YEAR	MONTH	DAY		TOTAL	CHLORO-FORM	ALCOHOL	ETHER INSOLUBLES	WATER SOLUBLES	TOTAL	ALIPHATICS	AROMATICS	OXYGEN-ATED COMPOUNDS	LOSS	WEAK ACIDS	STRONG ACIDS	BASES	LOSS
5	28	63	6	5	4800#	676	343	333	14	58	148	24	22	98	4	55	21	10	37
6	5	63	6	12	4000#	449	247	202	10	50	101	24	17	55	5	32	22	7	25
7	3	63	7	12	3750	1057	663	394	42	104	288	40	43	188	17	96	70	17	46
7	31	63	8	7	3600	944	511	433	20	68	208	31	27	132	18	91	50	9	65
8	30	63	9	10	3750	931	541	390	54	87	214	35	27	138	14	78	58	11	39

ESTIMATED

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE OHIO
MAJOR BASIN LAKE ERIE
MINOR BASIN CUYAHOGA RIVER
STATION LOCATION CUYAHOGA RIVER AT CLEVELAND, OHIO

126

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
12	12	62	-	-	7.7	-	-	-	-	-	171	128	268	10	*25	170	.0	725	-
12	19	62	-	-	7.6	-	-	-	-	-	135	126	288	10	*25	225	.0	640	-
12	26	62	-	-	7.6	-	-	-	-	-	148	114	284	10	*25	153	.0	615	-
1	2	63	2.0	9.9	7.6	6.2	-	-	-	-	32	90	148	-	*25	35	.0	220	1200
1	9	63	11.0	5.3	8.0	5.1	-	-	-	-	136	126	272	-	*25	210	.0	650	12000
1	16	63	2.0	8.8	7.1	7.1	-	-	-	-	90	84	232	-	*25	160	.0	480	4900
1	23	63	.0	12.9	7.2	2.7	-	-	-	-	-	-	-	-	-	-	-	-	100
1	30	63	1.0	12.4	7.6	2.5	-	-	-	-	45	88	150	-	*25	50	.0	241	*67
2	6	63	1.0	10.2	7.9	2.0	-	-	-	-	40	92	130	-	*25	30	.0	210	500
2	13	63	1.0	12.7	7.6	3.5	-	-	-	-	32	96	136	5	*25	36	.0	200	600
2	20	63	9.0	5.4	7.5	9.0	-	-	-	-	197	144	308	15	*25	240	.0	810	-
2	27	63	.0	14.0	7.4	6.8	-	-	-	-	40	88	130	5	*25	30	.0	220	1000
3	6	63	4.0	7.6	6.8	11.3	-	-	-	-	90	50	160	5	*25	90	.0	360	63000
3	13	63	3.0	11.5	6.8	10.2	-	-	-	-	25	56	140	10	380	65	.0	250	52000
3	20	63	4.0	11.2	6.7	8.5	-	-	-	-	35	48	116	5	350	70	.0	230	60000
3	27	63	8.4	9.1	6.6	12.0	-	-	-	-	55	32	164	5	*25	115	.0	320	60000
4	3	63	1.6	6.1	6.4	7.2	-	-	-	-	65	56	192	5	*25	142	.0	350	26000
4	10	63	4.0	5.2	6.5	9.2	-	-	-	-	60	60	200	5	*25	172	.0	400	140000
4	17	63	10.0	2.7	6.5	8.0	-	-	-	-	116	92	220	10	*25	175	.0	520	78000
4	24	63	1.4	4.6	6.8	7.7	-	-	-	-	35	84	224	15	*25	172	.0	420	8000
5	1	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*67
5	8	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	800
5	15	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1500
5	22	63	14.0	2.0	6.5	9.3	-	-	-	-	210	36	260	10	*25	188	.0	750	-
5	29	63	22.0	6.8	6.4	6.8	-	-	-	-	120	56	220	15	*25	250	.0	690	100
6	5	63	25.0	2.1	6.4	6.6	-	-	-	-	180	46	250	5	*25	175	.0	650	6300
6	12	63	25.0	1.1	6.7	7.0	-	-	-	-	175	94	240	5	*25	175	.1	610	400000
6	19	63	24.0	1.3	6.5	7.3	-	-	-	-	180	80	270	10	*25	240	.0	710	7300
6	26	63	27.0	2.2	6.6	11.2	-	-	-	-	250	52	260	10	*25	200	.0	780	3300
7	3	63	25.0	.6	6.6	7.8	-	-	-	-	210	78	270	5	*25	196	.0	700	500
7	10	63	25.0	1.5	6.5	6.3	-	-	-	-	300	80	350	10	*25	270	.0	980	1000
7	17	63	28.0	1.5	6.6	7.1	-	-	-	-	270	84	260	10	*25	220	.0	710	3700
7	24	63	28.0	2.5	7.0	7.0	-	-	-	-	220	106	290	5	*25	190	.0	740	1500
7	31	63	26.0	.3	7.0	8.4	-	-	-	-	180	104	250	20	*25	136	.0	560	82000
8	7	63	28.0	3.3	7.0	7.6	-	-	-	-	200	140	270	15	*25	200	.0	720	3900
8	14	63	25.0	7.2	6.8	5.3	-	-	-	-	180	100	260	5	*25	210	.0	700	80000
8	21	63	24.0	2.8	7.1	8.6	-	-	-	-	230	120	260	10	*25	240	.0	830	7400
8	28	63	26.0	2.7	7.0	8.0	-	-	-	-	100	102	260	5	*25	210	.0	720	300
9	4	63	26.4	1.7	7.7	8.2	-	-	-	-	260	56	380	5	*25	220	.0	840	1300

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE OHIO
MAJOR BASIN LAKE ERIE
MINOR BASIN CUYAHOGA RIVER
STATION LOCATION CUYAHOGA RIVER AT CLEVELAND, OHIO

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
9	11	63	26.0	.7	6.6	3.1	-	-	-	-	240	110	300	5	*25	220	.0	820	1100
9	18	63	24.0	2.0	7.0	4.1	-	-	-	-	160	116	300	5	*25	220	.0	660	1000
9	25	63	24.0	1.6	6.8	5.7	-	-	-	-	230	84	290	5	*25	240	.0	810	-
9	26	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8700

STREAM FLOW DATA - 1962-1963

Thousand Cubic Feet per Second

PROVISIONAL--SUBJECT TO REVISION

Computed Data for Cleveland, Ohio
Operated by U.S. Geological Survey

STATE Ohio

MAJOR BASIN Lake Erie

MINOR BASIN Cuyahoga River

STATION LOCATION Cuyahoga River at Cleveland, Ohio

Day	October	November	December	January	February	March	April	May	June	July	August	September
1	.278	.297	.250	.365	.229	.232	1.650	1.040	.342	.184	.257	.173
2	.263	.332	.238	.336	.231	.238	1.490	1.060	.308	.190	.228	.161
3	.255	.323	.224	.336	.241	.252	1.350	.826	.259	.182	.222	.165
4	.370	.340	.238	.311	.260	.436	2.780	.686	.233	.173	.258	.209
5	.305	.309	.259	.302	.271	1.970	1.630	.622	.264	.156	.207	.198
6	.471	.274	.479	.305	.282	5.080	1.330	.591	.259	.168	.211	.179
7	.359	.238	.419	.305	.315	3.460	1.180	.549	.254	.168	.227	.166
8	.365	.224	.387	.325	.362	2.930	1.080	.495	.239	.156	.218	.230
9	.370	.216	.366	.336	.321	3.060	.978	.450	.651	.156	.203	.241
10	.291	4.890	.356	.508	.301	2.410	.855	.418	.440	.153	.213	.268
11	.252	3.020	.356	1.390	.283	1.960	.754	.459	.506	.168	.181	.220
12	.226	1.400	.325	1.430	.280	3.380	.668	.400	.385	.167	.165	.418
13	.243	1.010	.303	1.010	.260	5.970	.605	.365	.364	.167	.183	.354
14	.196	.873	.294	.752	.249	4.140	.552	.371	.355	.202	.213	.228
15	.176	.827	.295	.618	.237	3.800	.506	.337	.320	.217	.195	.187
16	.226	.789	.305	.496	.230	3.720	.512	.317	.261	.189	.179	.162
17	.452	.961	.315	.426	.230	5.320	.529	.305	.242	.198	.175	.177
18	.267	.980	.374	.376	.229	4.960	.971	.312	.239	.244	.227	.184
19	.226	.731	.446	.366	.388	4.270	.890	.301	.229	.213	.174	.216
20	.209	.626	.789	.366	.374	6.140	2.670	.332	.217	.266	.247	.211
21	.220	.558	.608	.324	.314	5.110	1.290	.359	.221	.307	.219	.194
22	.200	.505	.572	.292	.281	4.070	.930	.326	.194	.221	.204	.190
23	.210	.426	.536	.283	.261	3.460	1.100	.306	.189	.287	.192	.186
24	.264	.392	.444	.261	.252	3.260	1.200	.297	.177	.246	.208	.210
25	.289	.345	.447	.251	.242	2.580	.990	.278	.188	.227	.207	.201
26	.333	.316	.432	.241	.230	2.240	.835	.257	.190	.185	.179	.210
27	.367	.316	.381	.241	.230	2.670	.728	.224	.190	.181	.190	.199
28	.456	.281	.388	.238	.231	2.280	.620	.293	.192	.197	.182	.192
29	.629	.272	.381	.228		2.000	.570	.548	.195	.483	.187	.194
30	.360	.264	.408	.229		1.930	.811	.431	.199	.494	.185	.194
31	.282		.352	.227		1.790		.360		.253	.189	

Computed as sum of Cuyahoga River at Independence, Ohio plus the sum of Ohio Canal at Independence, Ohio.

MAUMEE RIVER AT TOLEDO, OHIO

This station is located at the mouth of the Maumee River where it empties into Lake Erie. Samples are collected at the No. 2 slip of the Chesapeake and Ohio Railroad coal docks.

Twelve major municipalities in the Maumee River basin discharge from treatment plants, essentially all secondary effluents from an estimated connected population of 690,000. There is a complex of oil refining, glass, steel, chemical, meat packing and brewery industries in the Toledo area which discharges wastes directly or indirectly into the Maumee River.

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Station Location: Maumee River at Toledo, Ohio

Major Basin: Lake Erie

Minor Basin: Maumee River

Station at: 41° 42' Latitude 83° 28' Longitude

Miles above mouth: At mouth

Activation Date: October 4, 1962

Sampled by: City of Toledo, Division of Sewage Disposal

Field Analysis by: City of Toledo, Division of Sewage Disposal

Other Cooperating Agencies: U. S. Geological Survey
Ohio Department of Health

Hydrologic Data:

Nearest pertinent gaging station: At Waterville, Ohio

Gaging station operated by: U. S. Geological Survey

Drainage area at gaging station: 6,314 square miles

Period of record: 1921-35, 1939 to present

Average discharge in record period: 4,759 cfs

Maximum discharge in record period: 94,000 cfs

Minimum discharge in record period: 32 cfs

Remarks:

ALKYL BENZENE SULFONATE (ABS)

Date	mg/l

ELEMENTAL ANALYSES

		Composite Interval 10/1/62 to 12/31/62	Composite Interval 4/1/63 to 6/30/63
Analysis by wet or flame methods. Results in mg/l	F	-	.45
	Na	-	20
	K	-	4.7
Analysis by Spectrographic methods. Results in micrograms per liter	Zn	-	21
	Cd	-	9
	As	-	*10
	B	-	80
	P	-	187
	Fe	-	43
	Mo	-	34
	Mn	-	9
	Al	-	138
	Be	-	*.09
	Cu	-	39
	Ag	-	1.1
	Ni	-	9
	Co	-	*4
	Pb	-	19
	Cr	-	15
	V	-	*19
	Ba	-	34
	Sr	-	374

*Actual value is less than the amount shown. Reported result indicates limit of sensitivity at which test was performed. See text for explanation.

STRONTIUM 90 ACTIVITY

Composite Interval	pc/l	±	Composite Interval	pc/l	±
October to December	—	—	April to June	4.9	.4
January to March	3.6	.7	July to September	—	—

± at 95% Confidence Limits

SPECIFIC QUALITATIVE IDENTIFICATIONS FROM CARBON ADSORPTION EXTRACTS WATER YEAR 962-3

Interval	Compound	Concentration* ug/l

*Concentration values, where shown, are calculated from quantitative gas chromatographic analysis of the aromatic fractions of CCE, and may be assigned the units of ug/l. In light of the unknown efficiency of carbon adsorption sampling for these compounds, the reported values represent minima, the actual values being equal to or greater than the reported values.
See page 21.

RADIOACTIVITY DETERMINATIONS

STATE OHIO
MAJOR BASIN LAKE ERIE
MINOR BASIN MAUMEE RIVER
STATION LOCATION MAUMEE RIVER AT TOLEDO, OHIO

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DATE SAMPLE TAKEN			DATE OF DETERMINATION		RADIOACTIVITY IN WATER												DATE OF DETERMINATION		RADIOACTIVITY IN PLANKTON			
					ALPHA						BETA								GROSS ACTIVITY			
					SUSPENDED		DISSOLVED		TOTAL		SUSPENDED		DISSOLVED		TOTAL				ALPHA		BETA	
MO.	DAY	YR.	MO.	DAY	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	pc/l	±	MO.	DAY	pc/g	±	pc/g	±
2	6	63	2	25	0	1	1	1	1	1	10	7	44	10	54	12						
2	13	63	2	26	0	1	1	2	1	2	13	13	31	19	44	23						
2	20	63	3	7	1	2	5	4	6	4	13	13	46	18	59	22						
3	13	63	3	28	3	2	0	1	3	2	338	18	188	9	526	20						
3	20	63	4	4	1	3	1	1	2	3	219	37	128	11	347	39						
3	27	63	4	8	2	1	1	2	3	2	97	4	108	6	205	7						
4	3	63	4	16	1	1	1	2	2	2	63	13	77	17	140	21						
4	17	63	5	1	0	1	1	3	1	3	1	11	80	18	81	21						
4	24	63	5	15	2	1	0	1	2	1	76	14	103	18	179	23						
5	1	63	5	15	1	1	2	2	3	2	35	19	92	18	127	26						
5	9	63	5	24	0	1	0	2	0	2	21	12	80	16	101	20						
5	14	63	5	27	1	1	0	2	1	2	40	6	77	9	117	11						
5	22	63	6	5	0	1	2	2	2	2	22	12	81	16	103	20						
5	29	63	6	12	1	1	0	1	1	1	27	12	57	16	84	20						
6	5	63	6	17	0	1	0	3	0	3	6	5	61	8	67	9						
6	12	63	7	1	2	1	0	2	2	2	45	7	87	9	132	11						
6	19	63	7	3	1	1	0	1	1	1	7	6	96	19	103	20						
6	26	63	7	10	1	1	1	2	2	2	15	11	95	17	110	20						
7	3	63	7	23	0	1	2	2	2	2	6	6	66	11	72	13						
7	10	63	7	23	0	0	0	2	0	2	9	6	53	16	62	17						
7	17	63	8	6	0	0	2	2	2	2	10	6	52	9	62	11						
7	24	63	8	12	0	1	1	2	1	2	4	3	66	5	70	6						
7	31	63	8	12	1	1	0	1	1	1	7	3	46	5	53	6						
8	7	63	9	6	3	2	1	2	4	3	12	8	41	9	53	12						
8	21	63	9	16	0	1	1	2	1	2	3	3	34	5	37	6						
9	11	63	10	1	1	2	0	1	1	2	11	8	28	5	39	9						
9	25	63	10	10	0	1	2	2	2	2	1	5	26	9	27	10						

PLANKTON POPULATION

STATE OHIO

MAJOR BASIN LAKE ERIE

MINOR BASIN MAUMEE RIVER

STATION LOCATION MAUMEE RIVER AT TOLEDO, OHIO

DATE OF SAMPLE			ALGAE (Number per milliliter)									INERT DIATOM SHELLS		MOST ABUNDANT ALGAE - Genera and Count Level per ml. (See text for Codes)																	
			TOTAL	BLUE-GREEN		GREEN		FLAGELLATED (Pigmented)		DIATOMS				1ST		2ND		3RD		4TH		5TH		6TH		7TH		8TH		9TH		10TH	
MONTH	DAY	YEAR		COCCOID	FILAMENTOUS	COCCOID	FILAMENTOUS	GREEN	OTHER	CENTRIC	PENNATE	CENTRIC	PENNATE	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL	GENUS	COUNT LEVEL
2	6	63	11400	110	370	2930	0	260	0	7480	240	680	70	71	6	26	3	25	3	32	2	31	2	34	2	51	1	17	1				
2	18	63	27100	320	1800	1530	0	1530	540	21150	230	1130	0	71	8	17	4	51	4	26	3	3	2	60	2	15	1	38	1	31	1	65	1
3	6	63	4500	40	220	290	0	550	220	2900	310	1470	570	67	4	51	2	71	1	60	1	84	1	69	1	17	1	25	1				
3	20	63	400	0	0	60	0	80	20	110	80	360	270																				
4	3	63	2100	0	170	530	40	340	150	800	110	210	150	71	3	38	1	51	1	17	1	68	1										
4	17	63	15400	0	170	1430	0	170	0	12560	1050	920	250	71	7	34	3	92	2	82	2	38	1	30	1								
5	1	63	12600	0	920	1110	0	420	210	8880	1090	2750	380	71	6	68	4	67	3	17	3	69	2	51	2	38	2	92	2	26	1	88	1
5	15	63	7800	80	1030	2980	0	170	270	2770	530	1410	380	71	4	24	3	15	3	26	2	32	2	38	2	17	2	34	1	69	1	88	1
6	5	63	23400	1050	1180	16070	0	270	110	4350	400	1430	80	38	6	26	5	71	5	24	4	35	4	13	3	69	3	15	3	45	3	68	3
6	19	63	33100	590	180	8320	0	7610	720	14360	1360	1130	180	71	7	51	6	38	5	68	5	34	4	69	3	60	3	3	2	24	2	37	2
7	31	63	2400	230	190	790	0	60	0	970	170	410	100	38	2	3	1																
8	14	63	6000	0	310	2570	0	130	0	2290	700	1140	150	38	3	25	2	35	2	15	2	24	1										
8	28	63	4000	230	370	1620	0	60	20	1390	330	310	130	38	2	24	2	15	2	34	1												
9	11	63	6700	410	1370	2820	0	270	20	1060	720	720	180	15	3	24	3	38	3	3	2	25	1	35	1	51	1	17	1				
9	25	63	12000	320	1780	6380	140	650	0	1690	1060	1440	560	15	4	38	3	34	3	24	3	25	3	69	2	51	2	35	2	3	1	44	1

PLANKTON POPULATION

STATE OHIO
MAJOR BASIN LAKE ERIE
MINOR BASIN MAUMEE RIVER
STATION LOCATION MAUMEE RIVER AT TOLEDO, OHIO

| DATE OF SAMPLE | | | DOMINANT SPECIES OF DIATOMS AND PERCENT OF TOTAL DIATOMS (See text for Codes) | | | | | | | | | FUNGI AND SHEATHED BACTERIA (Number per ml.) | MICROINVERTEBRATES | | | | | | | | |

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE OHIO
MAJOR BASIN LAKE ERIE
MINOR BASIN MAUMEE RIVER
STATION LOCATION MAUMEE RIVER AT TOLEDO, OHIO

DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
10	4	62	1.7	2.6	7.2	8.6	-	-	-	-	46	130	174	-	20	72	1.2	-	-
10	17	62	10.0	-	7.3	-	-	-	-	-	34	140	176	20	-	64	.6	270	-
10	25	62	13.3	-	7.5	-	-	-	-	-	36	156	186	40	-	66	.5	284	-
11	1	62	10.0	-	7.3	-	-	-	-	-	38	140	170	15	-	60	.9	288	-
11	8	62	10.0	-	7.0	-	-	-	-	-	40	132	174	70	-	68	.8	306	-
11	15	62	10.0	-	6.7	-	-	-	-	-	46	138	195	36	-	85	.4	334	-
11	29	62	6.5	-	7.4	-	-	-	-	-	-	148	206	44	-	88	.9	352	-
12	6	62	6.5	3.8	7.4	-	-	-	-	-	54	175	246	40	-	121	1.4	440	-
12	13	62	.5	11.6	7.2	7.5	-	-	-	-	44	144	193	-	30	79	.8	346	-
12	20	62	1.2	13.5	7.4	17.7	-	-	-	-	35	130	160	32	-	50	.5	248	-
12	27	62	1.2	11.3	7.5	6.0	-	-	-	-	44	138	180	20	-	68	.9	312	-
1	3	63	2.8	-	7.3	-	-	-	-	-	72	188	240	28	-	131	2.4	462	-
2	13	63	2.8	8.9	7.5	6.3	-	-	-	-	72	220	250	32	-	133	2.5	500	-
2	20	63	3.3	12.0	7.4	14.4	-	-	-	-	-	-	-	-	-	-	-	-	*100
3	6	63	-	8.6	7.5	10.2	-	-	-	-	-	-	-	-	-	-	-	-	24000
3	13	63	-	10.9	7.1	8.1	-	-	-	-	-	-	-	-	-	-	-	-	18000
3	20	63	-	12.0	7.0	5.7	-	-	-	-	-	-	-	-	-	-	-	-	-
3	27	63	7.8	12.7	-	4.5	-	-	-	-	-	-	-	-	-	-	-	-	13000
4	3	63	13.3	10.1	7.5	3.9	-	-	-	-	-	-	-	-	-	-	-	-	13000
4	17	63	-	9.8	-	5.4	-	-	-	-	-	-	-	-	-	-	-	-	31000
4	24	63	11.1	8.0	8.0	3.0	-	-	-	-	-	-	-	-	-	-	-	-	16000
5	1	63	11.7	-	7.7	-	-	-	-	-	-	-	-	-	-	-	-	-	30000
5	8	63	16.7	7.2	8.1	5.0	-	-	-	-	-	-	-	-	-	-	-	-	70000
5	15	63	16.7	4.9	-	4.0	-	-	-	-	-	-	-	-	-	-	-	-	-
5	22	63	16.7	4.2	7.5	4.0	-	-	-	-	-	-	-	-	-	-	-	-	39000
5	29	63	18.3	3.5	7.5	4.8	-	-	-	-	-	-	-	-	-	-	-	-	6400
6	5	63	22.8	4.2	8.0	-	-	-	-	-	-	-	-	-	-	-	-	-	31000
6	12	63	23.3	5.1	8.3	6.0	-	-	-	-	-	-	-	-	-	-	-	-	35000
6	19	63	22.2	5.5	8.4	7.2	-	-	-	-	-	-	-	-	-	-	-	-	180000
6	26	63	23.3	9.9	8.6	4.9	-	-	-	-	-	-	-	-	-	-	-	-	-
7	3	63	25.6	5.4	7.3	14.7	-	-	-	-	-	-	-	-	-	-	-	-	10000
7	10	63	23.9	2.4	7.9	1.2	-	-	-	-	-	-	-	-	-	-	-	-	160000
7	17	63	23.9	2.0	7.1	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-
7	24	63	25.6	2.0	8.1	1.2	-	-	-	-	-	-	-	-	-	-	-	-	32000
7	31	63	26.1	1.0	7.9	1.5	-	-	-	-	-	-	-	-	-	-	-	-	15000
8	7	63	23.9	2.7	7.1	.6	-	-	-	-	-	-	-	-	-	-	-	-	66000
8	14	63	22.2	3.3	7.9	.3	-	-	-	-	40	120	190	10	*25	84	.4	350	150000
8	21	63	21.1	4.1	7.9	3.0	-	-	-	-	-	-	-	-	-	-	-	-	450000
8	28	63	21.7	1.9	7.7	-	-	-	-	-	32	96	170	5	45	66	.5	270	640000

CHEMICAL, PHYSICAL AND BACTERIOLOGICAL ANALYSES

STATE OHIO
MAJOR BASIN LAKE ERIE
MINOR BASIN MAUMEE RIVER
STATION LOCATION MAUMEE RIVER AT TOLEDO, OHIO

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DATE OF SAMPLE			TEMP. (Degrees Centigrade)	DISSOLVED OXYGEN mg/l	pH	B.O.D. mg/l	C.O.D. mg/l	CHLORINE DEMAND		AMMONIA-NITROGEN mg/l	CHLORIDES mg/l	ALKALINITY mg/l	HARDNESS mg/l	COLOR (scale units)	TURBIDITY (scale units)	SULFATES mg/l	PHOSPHATES mg/l	TOTAL DISSOLVED SOLIDS mg/l	COLIFORMS per 100 ml.
MONTH	DAY	YEAR						1-HOUR mg/l	24-HOUR mg/l										
9	4	63	20.0	5.3	7.6	4.9	–	–	–	–	28	92	144	5	*25	60	.0	260	3200
9	11	63	21.1	1.9	7.5	1.8	–	–	–	–	–	–	–	–	–	–	–	–	19000
9	18	63	–	1.6	7.5	3.2	–	–	–	–	37	104	164	10	*25	72	.0	290	16000
9	25	63	17.4	2.4	7.9	7.8	–	–	–	–	–	–	–	–	–	–	–	–	200000

STREAM FLOW DATA - 1962-1963

Thousand Cubic Feet per Second

PROVISIONAL--SUBJECT TO REVISION

Gaging Station at Waterville, Ohio
Operated by U.S. Geological Survey

STATE Ohio

MAJOR BASIN Lake Erie

MINOR BASIN Maumee River

STATION LOCATION Maumee River at Toledo, Ohio

Day	October	November	December	January	February	March	April	May	June	July	August	September
1	.186	.272	.195	.240	.230	.500	5.330	1.540	1.180	.352	.538	.117
2	.186	.230	.195	.240	.220	.550	6.350	1.510	.822	.369	.352	.100
3	.235	.200	.190	.240	.220	.470	7.190	1.470	.566	.286	.703	.150
4	.248	.215	.186	.250	.220	.440	6.880	1.290	.524	.240	2.140	.144
5	.225	.220	.210	.250	.220	1.000	5.550	1.140	.510	.225	2.000	.064
6	.210	.215	.340	.240	.240	3.600	5.070	1.180	.631	.202	1.330	.092
7	.205	.220	.584	.250	.250	21.000	4.180	1.220	1.020	.240	1.380	.123
8	.256	.248	.184	.250	.260	30.200	3.460	1.220	3.240	.200	1.020	.141
9	.445	.248	.170	.250	.280	35.200	2.950	1.010	5.070	.159	.840	.135
10	.342	.346	.200	.600	.320	32.600	2.430	1.010	6.120	.165	.648	.117
11	.520	.233	.300	1.400	.400	27.400	1.890	.733	9.020	.172	.510	.117
12	.397	.190	.250	.500	.490	24.200	1.710	.786	5.590	.153	.385	.194
13	.280	.276	.210	.250	.500	21.000	1.440	.858	5.180	.153	.490	.087
14	.240	.361	.190	.230	.550	18.700	1.250	.930	3.970	.410	.258	.069
15	.220	.721	.170	.240	.550	19.200	1.080	.614	2.640	.278	.218	.078
16	.323	.716	.170	.240	.500	18.000	.968	.750	1.970	.272	.249	.111
17	.353	.490	.160	.250	.480	17.100	1.140	.804	1.470	.716	.258	.159
18	.296	.430	.160	.270	.460	16.700	1.100	1.080	1.140	.699	.188	.147
19	.296	.288	.170	.320	.550	16.500	3.050	.840	.894	1.280	.202	.147
20	.272	.419	.190	.330	1.100	16.600	10.200	.987	.699	1.440	.267	.150
21	.256	.438	.210	.320	.400	16.400	11.500	.987	.496	3.030	.232	.141
22	.230	.688	.210	.300	.450	14.600	9.340	.949	.440	4.280	.225	.141
23	.554	.240	.200	.290	1.000	11.500	7.500	.786	.454	3.600	.232	.117
24	.320	.706	.200	.280	1.100	9.260	5.220	.733	.440	3.110	.218	.141
25	.306	.264	.230	.280	.900	7.380	4.040	.614	.396	2.030	.172	.172
26	.328	.210	.210	.270	.750	4.960	3.600	.648	.374	1.350	.188	.165
27	.190	.419	.200	.260	.650	7.000	2.820	.648	.321	1.080	.188	.157
28	.186	.312	.190	.240	.550	7.860	2.030	.750	.267	.858	.188	.152
29	.198	.248	.320	.220		8.180	2.050	.768	.303	.631	.188	.060
30	.164	.210	.280	.210		7.150	2.030	.631	.374	.396	.188	.123
31	.230		.260	.230		5.860		1.400		.418	.165	

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